

EXHIBIT F

**UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF WEST
VIRGINIA AT CHARLESTON**

**IN RE: ETHICON, INC., PELVIC REPAIR
SYSTEM PRODUCTS LIABILITY
LITIGATION**

**THIS DOCUMENT RELATES TO
WAVE 5**

Master File No. 2:12-MD-02327

**JOSEPH R. GOODWIN
U.S. DISTRICT JUDGE**

**EXPERT REPORT OF
BRUCE ROSENZWEIG, M.D.**

I. QUALIFICATIONS

I am currently an Assistant Professor of Obstetrics and Gynecology at Rush University Medical Center in Chicago, Illinois. I received my MD degree in 1984 from the University of Michigan in Ann Arbor, Michigan. Following graduation from medical school, I completed an Obstetrics and Gynecology Residency at Michael Reese Hospital in Chicago. In 1988, I attended a one year pelvic surgery fellowship at State University of New York in Syracuse, New York. Following that fellowship, I attended a two year Urogynecology and Urodynamics fellowship at UCLA Harbor General Hospital in Torrance, California. After graduating from the Urogynecology fellowship, I became a faculty member at the University of Illinois in Chicago. I started a Urogynecology program at the University of Illinois and also was the residency program director. In 1998, I went into private practice, and subsequently established a private practice at Rush University Medical Center. I have also worked at John H. Stroger Hospital here in Chicago from May 2003 until November 2010 and Weiss Memorial Hospital

as Associate Chair of Gynecology from February 2011 until July 2012. I have published numerous articles and given numerous lectures on the topics of pelvic organ prolapse, urinary incontinence and repair of pelvic organ prolapse.

Throughout my career, I have performed over a thousand pelvic floor surgical procedures, including abdominal sacrocolpopexy, uterosacral suspensions, sacrospinous ligament fixations, native tissue repairs, biological graft repairs and synthetic mesh repairs. I have also used numerous synthetic pelvic mesh products, including Ethicon's TVT, TVT Obturator, and Prolift. In addition, I have performed over 300 surgeries dealing with complications related to synthetic mesh, including the removal of numerous TVT devices. I was also invited by Ethicon and attended both its Gynecare Prolift Training Seminar and TVT Obturator Seminar in Belgium. In addition, I was also invited and attended a Bard Avaulta training seminar.

A copy of my CV and Fee Schedule is attached as Exhibit "A" and a copy of my testimony for the last four years is attached as Exhibit "B". The documents I relied on for this report are contained in Exhibit "C" as well as those documents cited throughout this Report.

II. SUMMARY OF OPINIONS

In formulating my opinions and preparing this report, I reviewed scientific literature, corporate documents from Ethicon, sample products and depositions of Ethicon employees and witnesses. The corporate documents, sample products and depositions were supplied to me by counsel. A list of the materials reviewed and relied upon are attached hereto as Exhibit "C". All opinions I have are to a reasonable degree of medical and scientific certainty. I understand discovery is still ongoing in this case, and I reserve my right to amend my opinions if further information is provided in any form including, but not limited to corporate documents,

depositions and the expert reports of both Plaintiff and Defense experts.

In general, my expert opinions can be summarized as follows¹:

- A.** Ethicon's old construction mesh (Prolene), used in the TVT Abbrevo, is not suitable for its intended application as a permanent prosthetic implant for stress urinary incontinence because it is too rigid or stiff, the pores are too small, it is heavyweight mesh, it degrades over time, and causes chronic foreign body reactions, fibrotic bridging, mesh contracture/shrinkage, biofilm formation and infections;
- B.** Ethicon knew that the old construction (Prolene) was not appropriate for use in its TVT Abbrevo device but has failed to modify/change the laser cut mesh to a larger pore, lighter weight, less rigid mesh that would not increase the risk of erosions and sexual dysfunction, degrade, cause excessive foreign body reactions, and cause excessive shrinkage/contraction because of its economic interest in maintaining its competitive advantage in the MUS market and, therefore, Ethicon put profits before patient safety;
- C.** Ethicon's warnings and disclosures of adverse events in its TVT Abbrevo Instructions for Use ("IFU") are inadequate based on the adverse reactions and risks associated with the TVT that were known to Ethicon from the time the TVT was first sold and marketed;
- D.** Ethicon did not disclose information to physicians in its IFUs regarding characteristics of the old construction mesh (Prolene) that makes it unsuitable for its intended application as a permanent prosthetic implant for stress urinary incontinence, including that it is too rigid, small pore, heavyweight mesh, it degrades over time, and causes chronic foreign body reactions, fibrotic bridging, and mesh contracture/shrinkage;
- E.** Ethicon did not inform physicians and patients that Material Safety Data Sheets ("MSDS") for polypropylene resin used to manufacture polypropylene meshes warned against use of the mesh in a permanently implanted medical device due to incompatible with peroxides and that studies showed that it caused sarcomas in laboratory rats;

¹ This is not intended to be an exhaustive recitation of my opinions in this case. The full scope of my opinions are described in further detail in this report.

- F.** Ethicon did not properly inform physicians that toxicity testing of the polypropylene mesh revealed that it was cytotoxic;
- G.** Ethicon's promotional materials sent to physicians related to the TVT Abbrevio were inaccurate and failed to reveal material information about complications/risks and conflict of interests regarding data promoted in the materials;
- H.** Ethicon's patient brochures misstate or omit information regarding complications and success rates and overstate the benefit of the TVT Abbrevio while understating the risks;
- I.** Ethicon's collection and reporting of adverse events and complications to physicians and patients is misleading, inaccurate and incomplete; and
- J.** The benefits of the TVT Abbrevio are outweighed by the severe, debilitating and life changing complications associated with the TVT Abbrevio.

III. BACKGROUND AND TREATMENT OPTIONS FOR SUI

A. Stress Urinary Incontinence ("SUI")

Approximately one of three women over the age of 45 years old has some form of urinary incontinence. The majority of those women do not seek medical advice or treatment for a variety of reasons.

In a continent individual, increased abdominal pressure is evenly distributed over the bladder, bladder neck, and urethra. The urethral sphincter is thus able to withstand this pressure and maintain continence. In a person with pure stress urinary incontinence (SUI), either the urethra is hypermobile or the sphincter is intrinsically deficient. In urethral hypermobility, the urethrovesical junction (UVJ) is displaced extra-abdominally, and the increased intra-abdominal pressure is unevenly distributed such that the sphincter can no longer withstand the pressure and urine leaks. With intrinsic sphincter deficiency (ISD), the UVJ is not hypermobile; however, the maximal urethral closing pressure, the Valsalva leak-point pressure, or both are too low to

withstand the increase in intra-abdominal pressure and, thus, urine leaks past the sphincter.

SUI is the involuntary leakage of urine during moments of physical activity that increases abdominal pressure, such as coughing, sneezing, laughing, or exercise, in the absence of a bladder contraction. It has been estimated that 14% of women have SUI. SUI is a common type of urinary incontinence in women. Urodynamic proven SUI is found in approximately 50% of women presenting for evaluation of urinary incontinence. Symptomatic women with SUI have social or hygienic consequence from their urine loss. SUI can happen when pelvic tissues and muscles, which support the bladder and urethra, become weak and allow the bladder “neck” (where the bladder and urethra intersect) to descend during bursts of physical activity (urethral hypermobility). This descent can prevent the urethra from working properly to control the flow of urine. SUI can also occur when the sphincter muscle that controls the urethra weakens (intrinsic sphincter deficiency). The weakened sphincter muscle is not able to stop the flow of urine under normal circumstances, and when there is an increase in abdominal pressure. Weakness may occur from pregnancy, childbirth, aging, or prior pelvic surgery. It has been estimated that a majority of incontinent women have a combination of urethral hypermobility and ISD. Other risk factors for SUI include chronic coughing or straining, constipation, obesity and smoking. Finally occult or latent SUI is defined as a positive stress test, loss of urine with increased intra-abdominal pressure and between 350-450cc volume in the bladder, after the repositioning of pelvic organ prolapse (usually accomplished with a ring pessary carefully positioned as to avoid compression of the urethra) in an otherwise clinically continent patient.

B. Nonsurgical Treatment of SUI

There are numerous non-surgical treatments available to woman with SUI. First, Pelvic Floor Exercises: A type of exercise to strengthen the pelvic floor by contracting and relaxing the

levator muscles that surround the opening of the urethra, vagina, and rectum. These exercises, commonly referred to as Kegel exercises, improve the pelvic floor muscles' strength and function. Kegel exercises can improve over-active bladders by increasing urethral resistance with can trigger the bladder to relax.

Second, Pessary: A removable device that is inserted into the vagina against the vaginal wall and urethra to support the bladder neck. This helps reposition the urethra to reduce SUI. These can be made of rubber, latex or silicon. Inserted into the vagina, a pessary rests against the back of the pubic bone and supports the bladder. Pessaries are available in various forms, including donut and cube shapes, and must be fitted by a healthcare provider. Some women who have stress incontinence use a pessary just during activities that are likely to cause urine leakage, such as jogging. Special incontinence pessaries have a 'knob', which fits under the urethra to elevate the midurethral to prevent urine loss.

Third, Transurethral Bulking Agents: Bulking agent injections are applied around the urethra that make the space around the urethra thicker, thus helping to control urine leakage. The effects are usually not permanent.

Fourth, Behavioral Modification: This includes avoiding activities that trigger episodes of leaking. Lifestyle modification can improve stress incontinence symptoms and include quitting smoking, weight loss, and allergy treatment during seasonal allergies.

Fifth, Urinary seals: These are adhesive foam pads, which women place over the urethral opening. The pad creates a seal and prevents the leakage of urine, providing incontinence treatment. The pad is removed before urination and replaced with a new one afterward. The pad can be worn during exercise or physical activity, but not during sexual intercourse.

Sixth, Urethral insert: A thin, flexible tube that is solid rather than hollow (like a catheter)

is placed into the urethra to block the leakage of urine. These small plugs are inserted into the urethra by women to prevent leakage, and are removed prior to urination. These inserts can be uncomfortable and may increase the risk of urinary tract infection.

Seventh, Bladder neck support device: This device is a flexible ring with two ridges. Once inserted into the vagina, the ridges press against the vaginal walls and support the urethra. By lifting the bladder neck, it provides better bladder control in women suffering from stress incontinence. The device needs to be sized to fit, and must be removed and cleaned after urination. Bladder neck support devices can be uncomfortable and may cause urinary tract infections.

C. Surgical Treatment of SUI

1. THE BURCH COLPOSUSPENSION

Retropubic approaches for the treatment of stress urinary incontinence include the Burch retropubic urethropexy (both open and laparoscopic) and the Marshall-Marchetti-Krantz (MMK) procedure. The goal of both of these procedures is to suspend and stabilize the urethra so that the urethrovesical junction (UVJ) and proximal urethra are replaced intra-abdominally and to recreate a firm backstop for intra-abdominal pressure. This anatomic placement allows normal pressure transmission during periods of increased intra-abdominal pressure restoring continence in a previously incontinent, hypermobile UVJ.

The Burch procedure was described in 1961. Initially, Burch described attaching the paravaginal fascia to the arcus tendineus. However, this was later changed to Cooper's ligaments because these were felt to provide more secure fixation points, and less chance of infection as seen with the prior MMK procedure.

Patients with type III stress urinary incontinence (a fixed, nonfunctioning proximal

urethra) are not ideal candidates for a Burch procedure as no hypermobility exists to correct. For the Burch procedure, a low Pfannestiel incision is made above the pubic bone in order to enter the space of Retzius (the anatomical space between the pubic bone and the bladder above the peritoneum in order to suspend the bladder and/or to perform a paravaginal repair. The procedure involves placing permanent stitches adjacent to the neck of the bladder and either proximal or distal to the bladder neck stitches on each side and suturing them Cooper's ligament which is attached to the pubic bone. The paravaginal repair is very similar except that the stitches are attached to the arcus tendentious linea pelvis. The likelihood of success of the Burch and the paravaginal repair procedures is reported to be 80-90% in most cases. Success means total elimination of the incontinence and patient satisfaction score greater than 90%. Improved means significant reduction of urine loss and greater than 70% improvement of patient satisfaction scores. Additionally, these retropubic procedures can be accomplished by the laparoscopic route. With respect to the selection of synthetic absorbable suture versus non-absorbable suture, and braided versus monofilament, no prospective randomized blinded data exist to suggest superiority of one suture material over another. However, recognized risks are associated with bone anchors. Modifications in the technique can be used if co-existent central defect cystocele is present and obliteration of the cul-de-sac can be performed to prevent enterocele or posterior vaginal wall prolapse after Burch colposuspension.

2 PUBOVAGINAL SLING PROCEDURES

Pubovaginal slings have excelled overall success and durable cure. The procedure involves placing a band of autologous, allograft, xenograft or synthetic material directly under the bladder neck (ie, proximal urethra) or mid-urethra, which acts as a physical support to prevent bladder neck and urethral descent during physical activity. This is brought up through

the rectus fascia. The sling also may augment the resting urethral closure pressure with increases in intra-abdominal pressure.

Historically, surgeons have used the fascia lata sling for recurrent SUI after a failed anti-incontinence operation. Furthermore, this operation is used extensively for the treatment of primary ISD. If the abdominal tissues are weak and attenuated or if the vaginal tissues are atrophied or in short supply, constructing a pubovaginal sling from the leg fascia lata can be performed. This procedure is more involved than the creation of the rectus fascial sling as it requires a second incision to harvest the fascia lata and healing in an area remote for the index procedure.

An alternative to a long rectus sling is construction of a short sling from a much smaller piece of abdominal fascia (rectus fascia suburethral sling). The surgical procedure is similar to that used for the rectus fascia pubovaginal sling, except that the harvested fascial tissue is much smaller and the operation time shorter. The advantage of this procedure is its simplicity. No extensive dissection in the suprapubic area is necessary, and the postoperative result is similar to that of the full-length fascial strip sling.

An alternative to a long fascia lata sling is the use of a postage stamp-sized patch of fascia lata from the outer thigh (fascia lata suburethral sling). The surgical procedure is similar to that for the fascia lata pubovaginal sling, except the harvested fascia is much smaller. This operation does not require extensive dissection in the thigh area, and the postoperative result is similar to that of the full-length fascia lata strip sling. Postoperative convalescence is shorter than that of the fascia lata pubovaginal sling procedure.

The vaginal wall suburethral sling helps restore urethral resistance by increasing urethral compression and improving mucosal coaptation of the bladder neck. This operation is attractive

because it is simple and easy to perform. Postoperative complications are minimal, and the recuperative period is short. Vaginal sling surgery is relatively contraindicated in elderly women with atrophic vaginitis. If recognized before surgery, the atrophied vaginal wall may be revitalized with the administration of vaginal estrogen cream or tablets for 3-6 months.

A clear contraindication to pubovaginal sling surgery is pure urge incontinence or mixed urinary incontinence (MUI) in which urge is the predominant component. An inherent risk of any sling procedure is de novo or worsening urge symptoms; thus, surgeons must identify and treat the presence of an urge component before surgery.

Conversely, poor detrusor function is a relative contraindication to pubovaginal sling surgery because the potential for urinary retention is increased. Women with absent or poor detrusor function in the presence of SUI are at a higher risk of experiencing prolonged postoperative urinary retention.

3. MIDURETHRAL SYNTHETIC SLINGS

Based on the “Integral theory of female incontinence,” Prof. Ulmsten developed a midurethral procedure to treat stress urinary incontinence. The first reports of this procedure appeared in 1996 as an intravaginal slingoplasty. The “tape” was placed through a small vaginal incision at the midurethra, brought through the urogenital diaphragm through the retropubic space and exited through small suprapubic incisions. The operation was theorized to correct incontinence by recreating the midurethral support of the pubourethral ligament and also by creating a midurethral hammock for support of the urethra during stress events. The procedure was described to have a success rate of 85-90% with an additional 5-10% significantly improved. The Gynecare TVT system was introduced in the US in November of 1998. Early studies

showed that the risk of bladder perforation during the procedure occurred 5-10% of cases and vascular injury with without hematoma formation occurred in 2-5% of patients.

In an attempt to decrease the risk of bladder perforation and vascular injury, a “top-down” approach to trocar placement was promoted as the SPARC procedure, introduced in the US in 2001 by American Medical Systems (AMS). The next modification of the midurethral sling came in 2001 when Delorme described his results for the use of the obturator membrane and inner thigh for passage of the sling material. The proposed advantage was avoidance of the retropubic space, thus avoiding bladder perforation and retropubic vascular injury. The trocars were passed from the inner thigh through the obturator membrane from an “outside – in direction”.

The next modification came from de Leval in 2003, with the “inside-out” trocar placement for the transobturator sling. This modification came around 2006 with the release of the mini-slings, or single incision slings, which use support devices at the ends of shorter mesh lengths to accomplish fixation without the need for a secondary cutaneous exit point. The mini-slings could be placed in a retropubic or “U” fashion or a hammock or “H” fashion.

The FDA concluded in 2011 that there was higher peri-operative blood loss, higher mesh exposure and greater need for surgical re-intervention in the TVT-Secur (mini-sling) patients.

IV. EXPERT OPINIONS

A. ETHICON’S PROLENE MESH IS NOT SUITABLE FOR ITS INTENDED APPLICATION.

Polypropylene mesh (Prolene), like that contained in the TVT Abbrevio, has many characteristics that make it unsuitable for use as a product intended for permanent implantation in the human vaginal floor. These characteristics include the following: (1) excessive rigidity of

laser-cut mesh; (2) degradation of the mesh; (3) chronic foreign body reaction; (4) infections and bio-films; (5) fibrotic bridging leading to scar plate formation and mesh encapsulation; and (6) shrinkage/contraction of the encapsulated mesh.

As a result of these and other inadequacies with the mesh, and for the reasons set forth below, it is my opinion to a reasonable degree of medical certainty that the Prolene polypropylene mesh in the TVT Abbrevio causes a multitude of injuries, including the possibility of multiple erosions that can occur throughout one's lifetime, chronic and debilitating pelvic pain, recurrence, worsening incontinence, chronic dyspareunia, nerve injury of the obturator, pudendal and other pelvic nerves, wound infection, rejection of the mesh, sexual dysfunction, urinary and defecatory dysfunction, vaginal scarring, wound healing problems, injury to ureters, pelvic abscess formation, risk of infection, and/or the need for additional surgeries, among others. As a result, Ethicon's TVT Abbrevio mesh (Prolene) is not suitable for its intended application as a permanent prosthetic implant for stress urinary incontinence in women.

1. LASER-CUT MESH

The Prolene mesh in the TVT Abbrevio is laser cut in the manufacturing process, as opposed to being mechanically cut.² This means that the plastic mesh is cut into strips using a laser instead a cutting blade.³ The result is that the mesh itself is stiffer than mechanically cut mesh.⁴ In fact, an internal memo from Becky Leibowitz to Paul Parisi and Dan Smith in late 2004 found that when the laser cut mesh was stretched it became about three times

² ETH.MESH.03941617; Deposition of Dan Smith, May 15, 2014, 48:11-17.

³ Lamont Dep. (9/11/13) 12:13-13:14.

⁴ ETH.MESH.01809080-01809081.

stiffer than the machine-cut TVT mesh.⁵ Just four years later, in meeting notes regarding the design of the TVT Abbrevio, it is noted that there is a consensus that laser cut mesh is more rigid and stiff and that no clinical study has been done regarding the differences between laser cut mesh and mechanical cut mesh.⁶ The notes further indicate potential benefits of using mechanical cut mesh over laser cut mesh noting a lower rate of erosions, tensioning would be more similar to current products, and the edges of mechanical cut mesh might allow for an easier insertion.⁷ Importantly, while these discussions about the differences between laser cut mesh and mechanical cut mesh were going on, most surgeons using the TVT products did not know what type of mesh they were using.⁸ Thus, there is no way for doctors to adjust tensioning differently or be aware that the mesh is stiffer, or to warn patients of an increased risk of erosions. Even as late as February 2015, Ethicon still has not done a single study to determine whether the laser cut mesh causes more erosions than mechanical cut mesh, whether laser cut mesh increases the amount of pain a patient will experience, or any critical outcomes.⁹

The difference in the stretch profile between mechanically cut and laser cut mesh also led Carl G. Nilsson and Christian Falconer, two of the inventors of the original TVT,¹⁰ and Jean de Leval, the inventor of TVT-O (predecessor to TVT Abbrevio), to refuse to use, and question the use, of laser cut mesh in the TVT Abbrevio.^{11, 12} Additionally, the shorter length of the laser cut mesh in the TVT Abbrevio leads to more complications. A report titled

⁵ ETH.MESH.01809080.

⁶ ETH.MESH.02090196

⁷ ETH.MESH.02090196.

⁸ ETH.MESH.009911296.

⁹ Trial Testimony of Katrin Elbert, *Perry v. Luu, et al.*, (2/11/15) 3433:27-3434:18.

¹⁰ Ulmsten U, Falconer C, Johnson P, Jomaa M, Lanner L, Nilsson CG, et al. A multicenter study of tension-free vaginal tape (TVT) for surgical treatment of stress urinary incontinence. *Int J Urogynecol J Pelvic Floor Dysfunct* 1998;9:210 –3.

¹¹ ETH.MESH.16416002-16416004; ETH.MESH.04048515-04048520.

¹² ETH.MESH.03941617.

“Things to consider as we assess next steps for a next generation sling,” includes a discussion regarding whether or not a shorter-length laser-cut mesh would be stiffer than even a longer laser-cut mesh.¹³ Dan Smith notes that the shorter slings will not stretch as much as the full length slings (i.e., stiffer) giving rise to more complications and that doctors will have to tension this mesh differently.

Moreover, according to the J&J Defendants, use of the laser cut mesh would make them unable to rely on the original studies and data they use to tout the safety and effectiveness of the original TVT.¹⁴ This data is something Ethicon wanted to rely on for this product.¹⁵ Additionally, laser cut mesh was never assessed on its own in a clinical trial.¹⁶ Finally, the rigidity of the laser cut mesh can cause a higher incidence of erosion and sexual dysfunction than mechanically cut mesh.¹⁷

2 THE PROLENE MESH IN TVT ABBREVO DEGRADES OVER TIME

The mesh used in the TVT Abbrevio was originally designed in 1974 for use in the abdomen for treatment of hernias and it has not changed since then.¹⁸ Ethicon describes this mesh as the “old, old” mesh: “The first generation (old, old) mesh is utilized currently in the TVT product...”¹⁹ Dan Smith testified that even when the original hernia mesh was updated for use in the abdomen, Ethicon continued to use the “old, old” mesh for TVT Abbrevio and does to this day, as follows:

Q: So TVT kept the old when hernia changed to the new.
A: Also known as original, yes.

¹³ ETH.MESH.09911296.

¹⁴ ETH.MESH.06040171-06040173.

¹⁵ Trial Testimony of Katrin Elbert, *Perry v. Luu, et al.*, (2/11/15) 3328-30.

¹⁶ ETH.MESH.03941617.

¹⁷ ETH.MESH.00294195-00294203; ETH.MESH.00271641; ETH.MESH.00328895; ETH.MESH.03916716.

¹⁸ Smith Dep. (2/3/2014) 723:9-724:6.

¹⁹ Smith Dep. (2/3/2014) 723:9-724:6.

- Q: The mesh that was used in the TVT-R is called sometimes by Ethicon in documents old construction or original mesh; correct?
- A: Yes. Yes.²⁰

In the late 90's Ethicon determined that, in the hernia applications, it was safer to move to a lighter weight, larger pore mesh. Ethicon made a similar determination for meshes to be used in the pelvic floor.²¹ However, Ethicon never updated the "old, old" hernia mesh used in the TVT Abbrevio.²² Notably, in my opinion this makes science and information regarding hernia meshes and other pelvic meshes of particular relevance when discussing the TVT Abbrevio mesh as Ethicon chose to move to large pore, light weight meshes in these areas, but not for TVT Abbrevio.

The placement of permanent polypropylene mesh in the human vagina creates problems because of the chemical composition and structure of the mesh and the physiological conditions of the vagina and the surrounding tissues. There have been numerous studies over the last 30 years which have shown polypropylene to be chemically reactive and not inert, with flaking and fissuring demonstrated by scanning electron microscopy, which leads to degradation and release of toxic compounds into pelvic tissues. This process enhances the inflammatory and fibrotic reactions within the tissues in the pelvic floor, causing a multitude of problems.²³ There have been studies suggesting that oxidation

²⁰ Smith Dep. (2/3/2014) 723:9-724:6.

²¹ See, e.g., ETH.MESH.07455220 (discussing mesh shrinkage/contracture and stating: "Since this phenomenon occurs most frequently in small pore, heavy weight mesh, ETHICON has developed large pore, light weight meshes, i.e. GYNECARE GYNEMESH PS Nonabsorbable Prolene Soft Mesh....").

²² Smith Dep. (2/3/14) 829:16-829:19.

²³ Coda A., *Hernia* 2003;7:29; Jongebloed, WL, "Degradation of Polypropylene in the Human Eye: A SEM Study," *Doc. Ophthalmol.*, 1986 64(1:143-152); Skrypnich, O.W., "Giant Papillary Conjunctivitis from an Exposed Prolene Suture," *Can. J Ophthalmology*, 198621:(5: 189-192).

of the mesh occurs because of the polypropylene and the conditions in which it is placed.²⁴

The oxidation causes the mesh to degrade, crack and break

apart.²⁵ In a recent study, 100 pelvic mesh implants were compared and over 20% showed degradation to mesh fibers.²⁶

Because of the structural complexities of the vagina and the nature of the chemicals ordinarily found in the vagina and its surrounding tissues, there are several reasons why polypropylene presents unique problems when placed in the vagina. An Engineering Bulletin from Propex, entitled “*EB-405, The Durability of Polypropylene Geotextiles for Waste Containment Application*,” from 2011, states that, “[P]olypropylene is vulnerable to the following substances: highly oxidized substances such as (peroxide), certain chlorinated hydrocarbons (halogenated hydrocarbons), and certain aromatic hydrocarbons.”²⁷ It is well known to physicians with expertise in the pelvic floor that vaginal and perivaginal tissues are ready sources for peroxide. The vaginal species lactobacillus produces hydrogen peroxide and lactic acid from glycogen that is produced in the squamous cells of the vagina. Estrogen is the catalyst for the production of glycogen from the vaginal cells. It is also well known that hydrogen peroxide produced by the lactobacillus species is important in controlling the vaginal micro- flora.

In fact, the vagina is a ready source of hydrogen peroxide production. In a manuscript from M. Strus, “*The In Vitro Effects of Hydrogen Peroxide on Vaginal Microbial*

²⁴ Costello C., et al., “*Characterization of Heavyweight and Lightweight Polypropylene Prosthetic Mesh Explants from a Single Patient*,” Surgical Innovation , 2007, 143:168- 176).

²⁵ *Id.*

²⁶ Clavé A, Yahi H, Hammou JC, Montanari S, Gounon P, Clavé H, “*Polypropylene as a Reinforcement in Pelvic Surgery is Not Inert: Comparative Analysis of 100 Explants*,” J Biomed Mater Res B Appl Biomater, 2007, Oct 83(1:44-9).

²⁷ Citing Schneider H., *Long Term Performance of Polypropylene Geosynthetics*, “*Durability and Aging of Geosynthetics*, Koerner, RM, Ed., (Elsevier 1989) 95-109.

Communities,” the authors show the amount of hydrogen peroxide produced by the lactobacillus species.²⁸ “Hydrogen Peroxide reached concentrations of 0.05 to 1.0mm, which under intensive aeration increases even up to 1.8 mm.”²⁹ These results confirmed the previous results of M. Strus in the publication, “*Hydrogen Peroxide Produced by Lactobacillus Species as a Regulatory Molecule for Vaginal Micro-flora*,” Med Dosw Mikrobiol, 2004: 56(1:67-77).

It is also known that aromatic hydrocarbons can be found in the human body. In a paper from HB Moon entitled, “*Occurrence and Accumulation Patterns of Polycyclic Aromatic Hydrocarbons and Synthetic Musk Compounds in Adipose Tissues of Korean Females*,” *Chemosphere* 2012 (86:485-490), these aromatic hydrocarbons were noted to be present in, “[t]otal concentrations of PAHs and SMCs in adipose tissues rang[ing] from 15 to 361 (mean:119) ngg(-1) lipid weight and from 38 to 253 (mean:106) nng(-1) lipid weight respectively.... The results of this study provide baseline information on exposure of PAHs and SMCs to the general population in Koreans.”

It has also been determined that halogenated hydrocarbons can be found not only in adipose tissue but also the blood stream. A paper entitled, “*Determination of Volatile Purgeable Halogenated Hydrocarbon in Human Adipose Tissue and Blood Stream*,” from the *Bulletin of Environmental Contamination and Toxicology*, Volume 23, Issue 1, pp 244 – 249 published in 1979, found halogenated hydrocarbons, pesticide by-products, both in human adipose tissues and the blood stream. In a subsequent paper from 1985 in *Environmental Health Perspectives*, Volume 60, pp. 127-131, Henry Anderson, in his paper

²⁸ Strus, M., et al., *The In Vitro Effect of Hydrgen Peroxide in Vaginal Microbial Communities*, FEMS ImmunolMed Microbiol, 2006 Oct; 48(1:56-63).

²⁹ *Id.*

entitled, “*Utilization of Adipose Tissue Biopsy and Characterizing Human Halogenated Hydrocarbon Exposure*,” also found these pesticide by-products in human adipose tissue. Accordingly, the body location where the polypropylene mesh is being placed can expose it to known chemical degradation agents.

However, chemical degradation is not the only way that polypropylene degrades *in vivo*. In a paper from N Das in the Journal of Biotechnology Research International, Volume 2011, Article ID 941810, entitled, “*Review Article: Microbial Degradation of Petroleum Hydrocarbons Contaminant: An Overview*,” found that various bacteria such as Pseudomonas species, Bacillus species, Mycobacterium and Corynebacterium species, which are present in a woman’s vagina, can degrade petroleum hydrocarbons. Also fungi such as the Candida species, also present, can degrade petroleum-based hydrocarbons.³⁰ Microbial agents that can be found inside the normal and abnormal flora of the human vagina such as Candida and, with certain pelvic infections such as Bacillus and Pseudomonas, can be a source of biological degradation of polypropylene products.

A paper entitled, “*Health, Safety and Environment Fact Sheet: Hazardous Substances - Plastics*,” from CAW/TCA (www.caw.ca), August 2011:343, found that polypropylene degradation products and residues can form carbon monoxide, acrolein, aldehydes and acids, qualifying these health hazards as toxic and irritants. In a paper from D Lithner in 2011 at 4, entitled, “*Environmental and Health Hazards of Chemicals in Plastic Polymers and Products*,” University of Gothenburg, it is stated that, “[n]on-biodegradable polymers can be degraded by heat, oxidation, light, ionic radiation, hydrolysis and

³⁰ Das, N, et al., *Review Article: Microbial Degradation of Petroleum Hydrocarbon Contaminants: an Overview*, J Biotech Res Intl, 2011, Article ID 941810, 1-13.

mechanical shear, and by pollutants such as carbon monoxide, sulphur dioxide, nitrogen oxide and ozone. This causes the polymer to get brittle, to fragment into small pieces and to release degradation products.” (Citations omitted.) Lithner continues, “[o]ther substances (besides monomers) are often needed for polymerization to occur, for instance initiators, catalysts, and, depending on manufacturing process, solvents may also be used. The resulting plastic polymer can be blended with different additives, for

instance plasticizers, flame retardants, heat stabilizers, antioxidants, light stabilizers, lubricants, acid scavengers, antimicrobial agents, anti-static agents, pigments, blowing agents and fillers, and is finally processed into a plastic product. There are many different plastic polymers and several thousand different additives, which result in an extremely large variation in chemical composition of plastic products.” *Id.* At 6 (citationsomitted). “Since plastic products are composed of many different chemicals, and the main part of these [are] broken down into something completely different; this complicates the prediction.” *Id.* at 8. “The type and quantity of degradation products formed may also be influenced by degradation mechanisms, presence of polymerization impurities, and surrounding factors, e.g. temperature and oxygen.” *Id.* at 9. “Few studies combining leaching tests with toxicity tests have been performed on plastic products.” *Id.* at 12. The available peer-reviewed literature regarding degradation/oxidation of polypropylene in the human body dates back to the 1960’s and has been reported in numerous such publications.³¹

Two of the more important and salient articles regarding reported degradation in explanted surgical meshes (hernia and pelvic floor) are the Costello and Clave articles. In his

³¹ Liebert, T, et al., *Subcutaneous Implants of Polypropylene Filaments*, J Biomed Mater Res. 1976 (10:939-951); Williams, D., *Review of Biodegradation of Surgical Polymers*, J Materials Sci, 1982 (17:1233-1246); Oswald, H.J., et al., *The Deterioration of Polypropylene By Oxidative Degradation*, Polymer Eng Sci, 1965 (5:152-158).

paper, “*Characterization of Heavyweight and Lightweight Polypropylene Prosthetic Implants from a Single Patient*,” Prof. C Costello reported that hernia mesh made of polypropylene oxidized and degraded as a result of the metabolites produced by phagocytic cells during the body’s inflammatory reaction to the mesh. High-magnification photographs showed

cracking and peeling of the polypropylene fibers. Ethicon referenced this article in internal emails.³²

Another article by A Clave, “*Polypropylene as a Reinforcement in Pelvic Surgery is Not Inert: Comparative Analysis of 100 Explants*,” also displayed high magnification photos of polypropylene fibers from explanted meshes and, in this case, the meshes were explanted from women’s pelvic floor tissue.³³ The heavyweight meshes showed even greater cracking than the lower density meshes, but according to Prof/Dr. Clave, ALL 84 of the polypropylene explants examined showed degradation. Oxidation of the implanted mesh due to free radical attack through the synthesis of peroxides, superoxides and hypochlorous acid during the chronic inflammatory phase was listed as just one potential cause for the oxidative degradation within the “septic environment” in which the pelvic meshes are placed.

Given the information available to Ethicon in the scientific and medical literature concerning the potential for degradation of polypropylene, it is my opinion to a reasonable degree of medical certainty that Ethicon should have conducted clinically relevant testing to determine if naturally occurring conditions in the vagina could cause polypropylene to degrade and if so, what the quantity and quality of the products of degradation would be,

³² ETH.MESH.005588123.

³³ Clave, A., *Polypropylene as a Reinforcement in Pelvic Surgery is Not Inert: Comparative Analysis of 100 Explants*, I Urogynecol J 2010 21:261-270.

whether they would be released into surrounding tissues and/or migrate in the woman's body, what the clinical implications for the woman would be and whether some women's body's would react differently to the mesh and degradative process and its by-products.

Ethicon's Daniel Burkley, a Principal Scientist at Ethicon, testified that the science supported the conclusion that mesh could shrink, contract and degrade. Specifically, Mr. Burkley agreed that the risk of degradation increases when you have a severe inflammatory response with mesh implanted in a contaminated field.³⁴ Mr. Burkley also testified that polypropylene mesh in human beings is subject to some slight degree of surface degradation.³⁵ He agreed that degradation might be better understood if Ethicon studied or tested a product that is permanently implanted in women.³⁶ In fact, according to Mr. Burkley, Ethicon only conducted one study related to degradation and Prolene material. This study consisted of a Prolene suture implanted into dogs.³⁷ Mr. Burkley testified that the study and photos from the dog actually showed that the Prolene material used in TVT Abbrevio degraded and was still degrading after 7 years.³⁸

It is now clear from Ethicon's internal documents that Mr. Burkley was incorrect when he said that Ethicon only performed one study related to degradation of Prolene. Contrary to Mr. Burkley's claim, he and other Ethicon scientists were involved in a Prolene human explant study that was conducted in 1987 which found that Prolene degrades while in the body. According to Ethicon's documents, Ethicon's scientists received 58 Prolene human

³⁴ Burkley Dep. (5/22/13) 184:17-24.

³⁵ Burkley Dep. (5/22/13) 206:2-11

³⁶ Burkley Dep. (5/22/13) 206:12-25.

³⁷ ETH.MESH.05453719 (Seven year data for ten year Prolene study: ERF 85-219).

³⁸ Burkley Dep. (5/23/13) 315:8-13.

explants from Professor Robert Guidon³⁹ which were analyzed by Ethicon's scientists using scanning electron microscopy ("SEM"). The SEM study revealed that 34 of the 58 Prolene explants (58%) were cracked. Further studies, including FTIR and melt point analysis, were conducted by Ethicon's scientists to determine the cause of the cracking observed in Prof. Guidon's explants. In a report authored by Mr. Burkley on September 30, 1987, he concluded that the Prolene explants had insufficient antioxidants to protect them from oxidation which led to *in vivo* degradation of the Prolene devices.⁴⁰ Importantly, Ethicon has not made any changes to Prolene since it was introduced to the market, except that, in 2011, they reduced the amount of Sanatanox (another antioxidant), which could potentially make Prolene more, not less, susceptible to oxidized degradation.⁴¹ Thus, Ethicon's internal studies clearly demonstrate that Ethicon's scientists had concluded that Prolene can degrade while implanted in the human body.

Ethicon subsequently hired an outside consulting firm to resolve the cause of the erosion of its surgical meshes for the pelvic floor. In a June 22, 2011 report, PA Consulting Group informed Ethicon that, "[p]olypropylene can suffer from degradation following implant... a process which initiates after a few days post implantation in animal studies."⁴² The consulting report discusses numerous images of polypropylene mesh that show "physical degradation" of the mesh.⁴³ In addition, in a 2009 presentation, Ethicon Medical Director Piet

³⁹ DEPO.ETH.MESH.00004755

⁴⁰ ETH.MESH.12831391 at ETH.MESH.1281392

⁴¹ ETH.MESH.02589032 and ETH.MESH.07192929 (May 18, 2011 PA Consulting Report: Investigating Mesh Erosion in Pelvic Floor Repair and PowerPoint presentations)

⁴² ETH.MESH.02589032 and ETH.MESH.07192929 (May 18, 2011 PA Consulting Report: Investigating Mesh Erosion in Pelvic Floor Repair and PowerPoint presentation).

⁴³ *Id.*

Hinoul stated that meshes are not biologically inert.⁴⁴

I have personally seen mesh that is broken, cracked and looks different from when it came out of the package. Interestingly, despite years of scientific literature, its own internal dog study and reports from consultants it hired that degradation of mesh occurs, Ethicon's Instructions for Use (IFU) continues to claim to this day that the mesh in the TVT Abbrevio, "is not absorbed, nor is it subject to degradation or weakening by the action of enzymes."⁴⁵ This is not simply inaccurate, but is false and misleading for all of the reasons stated above, including, most importantly, that Ethicon's own internal documents and testimony from its employees confirm that the mesh degrades.

It is my opinion to a reasonable degree of medical certainty that the mesh used in TVT Abbrevio degrades. The effect of chemical and biological degradation of the TVT Abbrevio Prolene mesh in a woman's tissues can lead to a greater foreign body reaction, enhanced inflammatory response and excessive scarring, which can lead to severe complications in patients, including the possibility of multiple erosions that can occur throughout one's lifetime, chronic and debilitating pelvic pain, recurrence, worsening incontinence, chronic dyspareunia, wound infection, rejection of the mesh, sexual dysfunction, urinary and defecatory dysfunction, vaginal scarring, wound healing problems, injury to ureters, pelvic abscess formation, risk of infection, and/or the need for additional surgeries, among others. As a result, the polypropylene in Ethicon's TVT Abbrevio mesh (Prolene) is not suitable for its intended application as a permanent prosthetic implant for stress urinary incontinence in women.

⁴⁴ ETH.MESH.01264260 (Presentation, "Prolift+M," P Hinoul, MD, Ethicon Pelvic Floor Expert's Meeting – Nederland, Utrecht, May 7, 2009).

⁴⁵ ETH.MESH.02340829 at 0835 (original TVT Abbrevio IFU), HMESSH_ETH_11049264 at 9272 (current TVT ABBREVO IFU).

Given the information available in the scientific and medical literature concerning the potential for degradation of polypropylene, it is my opinion to a reasonable degree of medical certainty that Ethicon should have conducted clinically relevant testing to determine if naturally occurring conditions in the vagina could cause polypropylene to degrade and if so, what the quantity and quality of the products of degradation would be, whether they would be released into surrounding tissues and/or migrate in the woman's body, what the clinical implications for the woman would be and whether some women's body's would react differently to the mesh and the degradative process and its by-products.

Moreover, Ethicon failed to inform physicians or patients about the potential for degradation of the mesh and the complications that could follow. In fact, Ethicon not only failed to disclose these risks to physicians and patients, it did not accurately describe these significant risks by calling them "transitory" and by putting inaccurate statements about degradation in its IFU. This is information physicians need to know in order to have a fair and proper conversation with their patients about the use of a product. Physicians rely on device manufacturers to inform them of the risks and complications associated with its products instead of downplaying them or inaccurately stating them. By not disclosing this safety information to physicians and their patients, it is my opinion to a reasonable degree of medical certainty that Ethicon failed to properly inform physicians and patients about the risks of degradation of Prolene mesh in the TVT Abbrevio. In addition, by failing to inform physicians, Ethicon did not provide them with an opportunity to discuss these risks with their patients.

3. CHRONIC FOREIGN BODY REACTION

The human body has a natural and fairly predictable "host defense response" to any

foreign object placed inside of it. Whether a splinter or a surgical mesh, the human body will send white blood cells to attack the invader and, if the products of inflammation cannot ward off or destroy the invader, including if the invader is anything from bacteria to prosthetic implants, the initial acute inflammatory phase is followed by a chronic inflammatory phase. Therefore, with the placement of something like a permanent surgical mesh in human tissues, there will be a chronic or permanent foreign body reaction to the implant, as well as a chronic inflammatory response by the body.⁴⁶ In fact, Ethicon Medical Directors, Piet Hinoul and Charlotte Owens,

have both testified that the chronic foreign body reaction created by the body's response to mesh can cause a severe inflammatory reaction, which can cause chronic pain, nerve entrapment, erosions, dyspareunia and the need for additional surgeries.⁴⁷

This is of particular concern with regard to the TVT Abbrevio device because of its unique passage. For example, Professor de Leval, the inventor of the TVT-O (TVT Abbrevio's predecessor), expressed his opinion that the development of pain (a significant issue with TVT Abbrevio as discussed below) is in part caused by a foreign body reaction to the mesh in close proximity to the obturator nerve bundle and its passage through the muscles of the leg. The report of a meeting with de Leval states as follows:

He is convinced, however, that the foreign body reaction of the mesh in the trajectory outside of the obturator membrane plays a role in the development of pain.... [The mesh] sits close to the peripheral branches" [of the obturator bundle].... The second source of pain comes from the presence of the tape in

⁴⁶ Klinge, U., et al., *Shrinking of Polypropylene Mesh In Vivo: An Experimental Study in Dogs*, Eur J Surg 1998, 164: 965-969; Klinge, U., *Foreign Body reaction to Meshes Used for the Repair of Abdominal Wall Hernias*, Eur J Surg 1998, 164:951-960; Klosterhalfen, B., *The lightweight and large porous mesh concept for hernia repair*, Expert Rev. Med. Devices 2005, 2(1); Binnebosel M, et al., *Biocompatibility of prosthetic meshes in abdominal surgery*, Semin Immunopathol 2011, 33:235-243; ETH.MESH.03658577 (Biocompatibility of Ultrapro).

⁴⁷ Hinoul Dep. (4/5/12) 99:09-25; (4/6/12) 518:14-520:20; (6/26/13) 175:1-176:17; 184:18-22; 328:10-24; Owens Dep. (9/12/2012) 98:11-99:07.

the adductors.... This is of specific importance in young, active and/or sportive patients.⁴⁸

Other consultants and experts in the field informed Ethicon that there would be chronic tissue reaction to its polypropylene meshes. During a 2006 meeting at one of Ethicon's facilities, Bernd Klosterhalfen, a pathology consultant expert for Ethicon, informed Ethicon that there can be a continuing reaction between tissues in the body and mesh for up to 20 years.⁴⁹ In addition, during a February 2007 meeting, Ethicon stated that there can be, "[E]xcessive FBR [foreign body reaction] > massive scar plate > more shrinkage."⁵⁰

Internally, Ethicon's scientists agreed. Dr. Holste testified that chronic foreign body reactions occurs in Ethicon's small pore, heavyweight meshes like the Prolene mesh found in the TVT Abbrevio.⁵¹ In fact, Dr. Holste testified that Ethicon developed lighter weight, large pore meshes in order to minimize the complications seen with heavyweight meshes like the Prolene used in TVT Abbrevio.⁵² Ethicon employee, Christophe Vailhe, testified that there can be an excessive inflammatory reaction or foreign body reaction that would lead to mesh erosion and contraction.⁵³ Despite its knowledge about the problems associated with chronic foreign body reaction, Ethicon continues to use a heavyweight, small pore mesh in its TVT Abbrevio product.

Contrary to this scientific evidence, Ethicon informed doctors in its IFU that its TVT

⁴⁸ ETH.MESH.04050265.

⁴⁹ ETH.MESH.00870466 (June 6, 2006 Ethicon Expert Meeting Meshes for Pelvic Floor Repair, Norderstedt).

⁵⁰ ETH.MESH.01218361 (Ethicon Presentation: "State of Knowledge in 'mesh shrinkage'-What do we know").

⁵¹ Holste Dep. (7/29/13) 52:5-55:21.

⁵² Holste Dep. (7/29/13) 51:3-53:6.

⁵³ Vailhe Dep. (6/21/13) 383:8-19.

Abbrevio mesh was “non-reactive with a minimal and transient foreign body reaction.”⁵⁴ This was despite all of the internal documents and testimony discussed above from Ethicon’s Medical Affairs and Research and Development employees that chronic foreign body reaction occurs in small pore, heavyweight meshes like the Prolene mesh in TVT Abbrevio. Moreover, as one of Ethicon’s lead engineers stated: “the foreign body reaction is not transitory – it doesn’t ever go away, but decreases over time to a minimal level.”⁵⁵ That is, it is chronic. I have reviewed numerous pathology reports from my own patients and other physician’s patients and pathology reports reviewed in litigations describing foreign body reactions. Hence, the mesh potentiates a chronic, long-term inflammation. This is contrary to the express language of the TVT Abbrevio IFU and, to this date, has yet to be corrected in that IFU.

For the reasons set forth above, it is my opinion to a reasonable degree of medical certainty that the Prolene polypropylene mesh in the TVT Abbrevio creates a chronic foreign body reaction which can lead to severe complications in patients, including the possibility of multiple erosions that can occur throughout one’s lifetime, chronic and debilitating pelvic pain, recurrence, worsening incontinence, chronic dyspareunia, wound infection, rejection of the mesh, sexual dysfunction, urinary and defecatory dysfunction, vaginal scarring, wound healing problems, injury to ureters, pelvic abscess formation, risk of infection, and/or the need for additional surgeries, among others. As a result, the polypropylene in Ethicon’s TVT Abbrevio mesh (Prolene) is not suitable for its intended application as a permanent prosthetic implant for stress urinary incontinence in women.

Moreover, Ethicon failed to inform physicians or patients about the potential for a

⁵⁴ ETH.MESH.02340829.

⁵⁵ ETH.MESH.00211259.

severe, chronic foreign body response and the complications that could follow. In fact, not only did Ethicon fail to disclose these risks, it mischaracterized the risks by calling them “transitory” and by putting inaccurate statements about foreign body response in its IFU. This is information physicians need to know in order to have a fair and proper conversation with their patients about the use of a product. Physicians rely on device manufacturers to inform them of the risks and complications associated with its products instead of downplaying them or inaccurately stating them. By not disclosing this safety information to physicians and their patients, it is my opinion to a reasonable degree of medical certainty that Ethicon failed to properly inform physicians and patients about the risks of foreign body response of Prolene mesh in the TVT Abbrevio. In addition, by failing to inform physicians, Ethicon did not provide them with an opportunity to discuss these risks with their patients.

4. INFECTIONS/BIO-FILMS

The placement of midurethral slings, including TVT Abbrevio, violates one of the most basic tenets of surgical teachings in that it is the placement of a permanent implant into the human through a “clean contaminated” surgical field, *i.e.* the vagina, which is not sterile and can never be completely sterilized, therefore, implantation through the vagina is contraindicated for every procedure and implantation.

In the TVT Abbrevio, the weave of the mesh produces very small interstices which allow bacteria to enter and to hide from the host defenses designed to eliminate them. The bacteria can secrete an encasing polysaccharide slime (biofilm), which further serves to shield the bacteria from destruction by white blood cells and macrophages.⁵⁶ The effect and

⁵⁶ Osterberg, B., et al., *Effect of Suture Materials on Bacterial Survival in Infected Wounds: An Experimental Study*, Acta. Chir. Scand 1979, 145:7 431-434; Merritt, K., *Factors Influencing Bacterial Adherence to Biomaterials*, J Biomat Appl 1991, 5:185-203; An, Y., *Concise Review of Mechanisms of Bacterial Adhesion to*

consequences of biofilm is to increase the foreign body reaction, resulting in chronic infections, chronic inflammation, erosions, and mesh and scar contracture, and was well known to Ethicon, as evidenced by the testimony of Ethicon's Head of Pre-Clinical, Dr. Joerg Holste.⁵⁷

Importantly, the biofilm actually serves as a protection for the bacteria surrounding the mesh fibers against the body's host defense response (white blood cells), which are intended to destroy foreign invaders like bacteria. Thus, the weave induces the creation of a shield against the body's defenses to the bacteria entrained in the woven mesh, inhibiting the body's ability to fight off the infective agents within the mesh. The large surface area promotes wicking of fluids and bacteria which provides a safe haven for bacteria which attach themselves to the mesh

during the insertion process.⁵⁸ Daniel Burkley testified that reducing surface area could reduce the amount of chronic inflammation.⁵⁹ Additionally, the size of the mesh placed equates to a large surface area with many places for bacteria to hide while being protected from host defenses leading to numerous complications.⁶⁰

There have been numerous peer-reviewed journal articles regarding secondary-mesh related infections as well as the dangers of implanting surgical mesh in a clean/contaminated field. Of note, in May of 2013, at the AUA meeting in San Diego, Dr. Shah and his

Biomaterial Surfaces, J Biomed Mater Res (Appl Biomater) 1998, 43:338-348; The TVM Group: J. Berrocal, et al., *Conceptual advances in the surgical management of genital prolapsed*, J Gynecol Obstet Biol Reprod 2004, 33:577-587.

⁵⁷ Holste Dep. (7/30/13) 295:24-298:14, 411:15-414:24.

⁵⁸ Klinge, U., et al., *Do Multifilament Alloplastic Meshes Increase the Infection Rate? Analysis of the Polymeric Surface, the Bacteria Adherence, and the In Vivo Consequences in a Rat Model*, J Biomed Mater Res 2002, 63:765-771; Vollebregt, A, et al., *Bacterial Colonisation of Collagen-Coated Polypropylene Vaginal Mesh: Are Additional Intraoperative Sterility Procedures Useful?*, Int Urogyn J 2009, 20:1345-51.

⁵⁹ Burkley Dep. (5/22/13) 371.

⁶⁰ Klinge, *supra* n. 26; Vollebregt, *supra* n. 26.

colleagues reported on the “*Bacteriological Analysis of Explanted Transvaginal Meshes*,” which included explanted samples of both SUI slings and prolapse meshes. Of the 50 explants examined, 52% of those explanted due to patient complaints’ of painful mesh were infused with pathogenic organisms, 20% of those explanted due to vaginal erosions had pathogenic organism, and 83% of those explanted due to urinary tract erosions were contaminated with pathogenic organisms.⁶¹

When polypropylene particles separate from the surface of the mesh fiber due to degradation, see *infra*, the surface area of the mesh is greatly increased thus providing even greater areas for bacterial adherence to the mesh, more elution of toxic compounds from the polypropylene, and also more of the free toxic polypropylene itself, all of which increases the

inflammatory reaction and intensity of the fibrosis.⁶² This cracking of the mesh surface also provides safe harbors for infectious bacteria to proliferate.

In his periodic histopathological analyses for Ethicon of its pelvic floor explants, Dr. Klosterhalfen reported to Ethicon that, in virtually 100% of those instances in which mesh had been explanted due to erosions, he found a secondary, mesh-related infection at the tissue/mesh interface.⁶³ Mesh exposure and erosion cause the fibers to be further exposed to bacteria that will adhere to and colonize on the mesh surface.

Ethicon employees have testified that they were aware of these biofilms forming on the surface of the mesh.⁶⁴ However, Ethicon never performed any long-term, clinical studies

⁶¹ Shah, K., et al., *Bateriological Analysis of Explanted TransvaginalMeshes* (Abstract 1144).

⁶² Jongebloed, *supra*, n. 1; Sternschuss, G, et al., *Post-Implantation Alterations of Polypropylene in the Human*, J Urol 2012, 188:27-32; Clave, *supra*, at 6.

⁶³ ETH.MESH. 00006636.

⁶⁴ Holste Dep. (7/30/13) 283:19-284:5.

to determine whether the warnings given to them through the peer-reviewed literature and by their own experts and consultants were accurate, namely that mesh-related infections are real; that they cause patient injury in the form mesh erosions and recurrent, late infections; and that the transvaginal implantation through and into the non-sterile, septic vagina is below the standard of care for any surgical technique, especially one used to treat non-life threatening conditions, such as stress urinary incontinence.

Therefore, it is my opinion to a reasonable degree of medical certainty that the TVT Abbrevio mesh is susceptible to biofilm formation due to the weave of the mesh allowing the infiltration, harboring, and protection of bacterial contaminants; the degraded mesh surface harboring bacteria; the passage through and into a clean/contaminated field; and after exposure/erosion of the mesh into the vagina or other organs, further contamination of the mesh with a multitude of vaginal flora that further increases the risk of harmful and recurrent infections in women. Accordingly, the TVT Abbrevio transvaginal technique, as well as the TVT Abbrevio mesh itself, are not safe for their intended purpose of implantation into a woman's pelvic tissues and can lead to severe complications in patients, including the possibility of multiple erosions that can occur throughout one's lifetime, chronic and debilitating pelvic pain, recurrence, worsening incontinence, chronic dyspareunia, wound infection, rejection of the mesh, sexual dysfunction, urinary and defecatory dysfunction, vaginal scarring, wound healing problems, injury to ureters, pelvic abscess formation, risk of infection, and/or the need for additional surgeries, among others. As a result, the polypropylene in Ethicon's TVT Abbrevio mesh (Prolene) is not suitable for its intended application as a permanent prosthetic implant for stress urinary incontinence in women.

Finally, Ethicon's claims in its IFU that the TVT Abbrevio mesh may "potentiate

infection” are misleading, at best. If, by the intentionally ambiguous term, “potentiate,” Ethicon means “cause,” then this is false for all of the reasons stated above. If by “potentiate,” Ethicon means “exacerbate an existing infection,” then the statement is misleading at best. Ethicon failed to warn physicians and patients that a slimy, protective biofilm could form on the mesh leading to painful erosions, recurrent, late infections and the need for mesh removal. The TVT Abbrevio IFU contrasts sharply with the PROLENE IFU on this issue. The PROLENE IFU states as follows: PROLENE Mesh in contaminated wounds should be used with the understanding that subsequent infection may require removal of the material.⁶⁵

Ethicon did not to include this risk, despite that unlike hernia mesh, TVT mesh is being implanted through a contaminated environment – the vagina. By failing to include this risk,

Ethicon did not adequately warn physicians about these important risks, nor by extension, provide surgeons with an opportunity to discuss these risks with their patients.

5. PORE SIZE AND FIBROTIC BRIDGING

Fibrotic bridging occurs when the fibers surrounding the pores of the mesh are too close together to allow the tissue in the pore enough room to recover from the trauma of tissue damage due to implanting a surgical prosthetic device. Pores that are large enough for good, newly-vascularized tissue tend to be filled with fatty tissue versus small pores that become filled with scarred or fibrotic tissue. In those instances, the scar forms across the pores or “bridges” from one side of the pore to the other. This can occur either due to the granulomas around the mesh fibers joining together or due to densely-formed fibroblasts

⁶⁵ ETH.MESH.05920616 (7/20/07 Email from Chomiak, M. re Defining Light Weight Mesh).

between these granulomas. Either way, such bridging can lead to the creation of a rigid, scar plate that can encapsulate the mesh with scar tissue. Simply put, small mesh pores that cause fibrotic bridging turn the mesh into a solid sheet of scar tissue and there is no space or room for tissue to grow into the mesh, which is the intended purpose of the mesh. The fibrotic bridging and scar plate prevents tissue in-growth and causes complications, including, among other things, pain with the rigid mesh, shrinkage or contraction of the mesh, erosions due to mechanical irritation in the tissue of a rigid, scar-plated mesh, nerve entrapment, chronic pain and dyspareunia.

This concept is best illustrated by a DVD produced by Ethicon which features an Ethicon consultant, Dr. Todd Heniford, talking about a heavyweight, small pore mesh called Marlex used for hernia repairs.⁶⁶ The Prolene mesh used in TVT Abbrevo is of heavyweight, small pore construction and, in fact, is even heavier than Marlex. Ethicon Scientists have acknowledged that the Marlex mesh in the video is similar to the Prolene in TVT Abbrevo in that is heavy weight small pore mesh.⁶⁷ At least one medical director, Dr. Thomas Divillio, has described the work done by Dr. Heniford and other as “material science” that would apply to both hernia and pelvic mesh products. In my opinion, this video, as well as other science and information regarding hernia meshes and other pelvic meshes is of particular relevance when discussing the TVT Abbrevo mesh as Ethicon chose to move to large pore, light weigh meshes in these areas but chose not to do so for the TVT Abbrevo.

⁶⁶ Heniford, B.T., 2007, *The benefits of lightweight meshes in Ventral Hernia Repair in Ventral Hernia Repair*, Video produced by Ethicon.

⁶⁷ ETH.MESH.05918776 (5/04/04 Email from Schiaparelli, Jill, Strategic Grown Subject: Marlex Experience); Batke Dep. (8/01/13) 87:12 - 88:10, 113:3-114:3, 257:23-259:13; Holste Dep (7/29/13) 51:3-53:6, 55:22-57:4; Vailhe Dep. (6/20/13) 182:2 185:5.

In the video, Dr. Heniford talks about the dangers of heavy weight, small pore meshes.⁶⁸ In fact, Dr. Heniford states, “there is no excuse for using heavy weight, small pore meshes in the human body.”⁶⁹ I have explanted numerous meshes from the TVT family and have witnessed meshes with extensive scar plating and mesh encapsulation similar to the hardened/stiffened mesh viewed in the Heniford video. In numerous emails, Ethicon employees discussed concerns regarding fibrotic bridging.⁷⁰ They have testified that the heavy weight, small pore type of mesh in the TVT Abbrevio can lead to an increased risk of foreign body reaction, contraction of the mesh, nerve entrapment, erosions and chronic pelvic pain.⁷¹

In other emails, when discussing these concepts, Ethicon’s World Wide Marketing Director for General Surgery, Marty Chomiak, states that “... we want to avoid ‘bridging’, therefore we think large pores are better than small . . .”⁷² Ethicon also had information and scientific knowledge regarding superior mesh designs to prevent fibrotic bridging and scar plating. Specifically, Ethicon also had scientific knowledge that light weight, large pore mesh could decrease the likelihood of foreign bodyreaction, fibrotic

⁶⁸ Heniford Video, supra, n. 46.

⁶⁹ *Id.*

⁷⁰ ETH.MESH.04037600 (Innovations in mesh development); ETH.MESH.05920616 (7/20/07 ; Emails from Chomiak, M. to Batke, B., et al. re Defining light weight mesh); ETH.MESH.05585033 (Boris Batke Presentation – Project Edelweis – Ultrapro); ETH.MESH.05446127 (3/13/2006 Emails from Holste, J. to Engel, D., et al re Mesh and Tissue Contraction in Animal – “Shrinking Meshes?”); ETH.MESH.05475773 (2/09/2007 Boris Batke, Ethicon R&D, Presentation: *The (clinical) argument of lightweight mesh in abdominal surgery*); ETH.MESH.04015102 (3/1/12 Email from Batke, Boris to Mayes, C. re AGES Pelvic Floor Conference-Gala Dinner Invitation); ETH.MESH.04037600 (3/15/12 Boris, B. PowerPoint Presentation, *Innovations in Mesh Development*, Melbourne AGES 2012).

⁷¹ Batke Dep. (8/1/13) 87:12-88:10, 113:3-114:3, 257:23-259:13; Holste Dep. (7/29/13) 51:3-53:6, 55:22-57:4; Vailhe Dep. (6/20/13) 182:2-185:5.

⁷² ETH.MESH.05920616 (7/20/07 Email from Chomiak, M. re Defining LightWeight Mesh).

bridging and scar plating.⁷³

Despite having clinical knowledge of the importance of pore size to successful outcomes, and dozens of emails about the importance of pore size, Ethicon's person most knowledgeable about pore size testified that Ethicon does not manufacture its mesh to a specific pore size. Dan Smith testified as follows:

Q: Does Ethicon have a validated test method to determine the pore size of its TVT mesh?

A: We determine the pore size by courses and wales and that is how it's done. So the courses and wale count is a validated test method.

Q: And I'm talking about pore size. Does Ethicon have a validated test method to determine its pore size for its mesh?

A: The construction of the mesh is -- does not have a pore size requirement.⁷⁴

In fact, Ethicon does not even have a test to measure the pore size of its mesh. Dan Smith testified:

Q. Mr. Smith, does Ethicon have a validated test to describe the pore size of its TVT meshes microns? Yes or no.

A. No....⁷⁵

Despite this information that it did not measure pore size or manufacture its mesh to a specific requirement, Ethicon repeatedly stated in advertising and marketing materials that its mesh was "large pore." For example, in one brochure, Ethicon promotes the mesh used in the TVT family of products (including TVT Abbrevio) as the "Largest pore size" of any of its

competitors, listing the size as 1379 um.⁷⁶ However, given that Ethicon has no verified methodology to measure pore size, Ethicon had no scientific basis upon which to base these

⁷³ Batke Dep. (8/1/13) 87:12-88:10, 113:3-114:3, 257:23-259:13; Holste (7/29/13) 51:3 - 53:6, 55:22 - 57:4; Vailhe Dep. (6/20/13) 182:2-185:5.

⁷⁴ Smith Dep. (2-3-14) 729:1 to 729:12.

⁷⁵ Smith Dep. (2-3-14) 779:5 to 779:8.

⁷⁶ ETH.MESH.00349508 at 9510.

statements. In fact, in internal documents, Ethicon scientists described PROLENE mesh as small pore: “Standard Mesh PROLENE small pores area weight 105 g/m2.”⁷⁷ One Ethicon Engineer measured a mesh and determined that there were two pore sizes in the mesh, a “major” and “minor” pore. “There are two distinct pore sizes in the PROLENE 6 mil mesh (TVT). The major pore is about 1176 um.... The minor pore is about 295 um.”⁷⁸ Certainly, neither of these pores was 1379 um, and the minor pore was substantially smaller.

In summary, for the reasons set forth above, it is my opinion to a reasonable degree of medical certainty that the Prolene polypropylene mesh in the TVT Abbrevio causes fibrotic bridging in the body, resulting in an increased inflammatory response leading to a multitude of injuries, including the possibility of multiple erosions that can occur throughout one’s lifetime, chronic and debilitating pelvic pain, recurrence, worsening incontinence, dyspareunia that can be chronic, nerve injury, wound infection, rejection of the mesh, sexual dysfunction, urinary and defecatory dysfunction, vaginal scarring, wound healing problems, injury to ureters, pelvic abscess formation, risk of infection, and/or the need for additional surgeries, among others. As a result, the polypropylene in Ethicon’s TVT Abbrevio mesh (Prolene) is not suitable for its intended application as a permanent prosthetic implant for stress urinary incontinence in women.

Moreover, Ethicon did not inform physicians and patients that its mesh was susceptible to fibrotic bridging. Ethicon failed to warn physicians and patients that fibrotic bridging could occur leading to painful erosions, recurrent, late infections, nerve injury and the need for mesh removal. By failing to do so, Ethicon did not adequately warn physicians about these important risks, nor by extension, provide surgeons with an opportunity to

⁷⁷ ETH.MESH.04941016.

⁷⁸ ETH.MESH.00584175 (Ex. T-3583); ETH.MESH.00584179 (Ex. T-3581).

discuss these risks with their patients.

6. **MESH CONTRACTURE/SHRINKAGE**

Mesh contracture or shrinkage is an event that takes place after the implantation of mesh and relates to the wound healing process that occurs after the surgical trauma of implanting a foreign body made of polypropylene in the sensitive tissues of the vagina and pelvis. By 1998, polypropylene mesh was known to contract or shrink 30-50%.⁷⁹ These findings were later confirmed in numerous papers, such as those by W Cobb and his colleagues – one of whom was Dr. Henniford (referenced above).⁸⁰ This also showed that heavier weight meshes like TVT Abbrevio led to greater amounts of contraction. The works of Cobb and Klinge/Klosterhalfen have been referenced in numerous Ethicon documents. Contraction or shrinkage has been shown to draw nerves close to the midurethral sling mesh both in the transobturator application⁸¹ and for retropubic application.⁸² Furthermore, contraction or shrinkage is closely related to the pore size and weight of the mesh. Small pore, heavy weight mesh leads to fibrotic bridging which leads to scar plates, mesh encapsulation and shrinkage or contraction of the mesh, which is compounded by the shrinkage effect associated with the normal wound healing process already occurring in the tissue.

⁷⁹ Klinge, U, *Shrinking of Polypropelen Mesh in Vivo: An Experimental Study in Dogs*, Eur J Surg 1998, 164:965-969.

⁸⁰ Cobb, W., et al., *The Argument for Lightweight Polypropylene Mesh in Hernia Repair*, Surgical Innovation 2005, 12(1):T1-T7.

⁸¹ Corona, R., et al., *Tension-free Vaginal Tapes and Pelvic Nerve Neuropathy*, J Min Invas Gynecol 2008, 15:3 262-267; Parnell, B.A., et al., *Genitofemoral and Perineal Neuralgia after Transobturator Midurethral Sling*, Obstet Gynecol 2012, 119:428-431; Jacquelin, B, *Complications of Vaginal Mesh: Our Experience*, Intl Urogyn J, 2009, 20:893-6; Tunn, R, *Sonomorphological Evaluation of Polypropylene Mesh Implants After Vaginal Mesh Repair in Women with Cystocele or Rectocele*, Ultrasound Obstetrics Gynecol 2007, 29:449-452.

⁸² Heise, C.P., et al., *Mesh Inguinodynia: A New Clinical Syndrome After Inguinal Herniorrhaphy?*, J Am Coll Surg

This phenomenon of shrinkage and its relation to the design of the pores as well as the consequences to the patient were illustrated in an email by Ethicon Scientist Joerge Holste in a

March 13, 2006 email discussing a paper he authored entitled “Shrinking Meshes?”⁸³ In his email, Dr. Holste states “this was our scientific statement on mesh shrinkage: Basically, small pores, heavy weight meshes induce more fibrotic bridging tissue reaction causing more mesh shrinkage during maturation of the collagenous tissue. See my presentation about biocompatibility.”⁸⁴ In addition, in a presentation by Boris Batke, Associate Director R&D, he states heavier-weight polypropylene mesh results in mesh contraction of 33%.⁸⁵ In an email dated November of 2002, related to a discussion of mesh used in a TVT product, Axel Arnaud, one of Ethicon’s medical directors, used 30% shrinkage of the mesh as a “rule of thumb.”⁸⁶ At an Ethicon expert meeting in Norderstedt, Germany in 2007, an Ethicon employee presented a PowerPoint entitled “Factors Related to Mesh Shrinkage” in which all of these issues were clearly laid out.⁸⁷

Mesh shrinkage was known by Ethicon as early as 1998 in published work by Ethicon’s then consultants, Uwe Klinge and Bernd Klosterhalfen.⁸⁸ They noted in these early papers that all polypropylene meshes shrink 30-50%. This was restated in later works by W Cobb and his colleagues⁸⁹--one of which was Dr. Heniford (referenced above). The words of Cobb and

⁸³ ETH.MESH 05446127, *supra*, n. 34.

⁸⁴ *Id.*

⁸⁵ ETH.MESH 05479717 (3/1/11 Boris Batke, Ethicon Associate Director R&D, Presentation: Ethicon PolypropyleneMesh Technology).

⁸⁶ ETH.MESH 03917375.

⁸⁷ ETH.MESH. 02017152 (Nordestadt Expert’s meeting 2007); ETH.MESH.01782867 (Factors Related to Mesh Shrinking).

⁸⁸ Klinge U, Klosterhalfen B, Muller M, Ottinger A, Schumpelick V. Shrinking of Polypropylene Mesh in vivo: An Experimental Study in Dogs. Eur J Surg. 1998: 164; 965-969

⁸⁹ ETH.MESH.07455220.

Klinge/Klosterhalfen have been referenced in numerous Ethicon documents and thus, Ethicon was well aware of these findings regarding the shrinkage or contraction of polypropylene meshes in vivo. Ethicon was further aware that heavier weight meshes led to greater amounts of contraction.

It is my opinion to a reasonable degree of medical certainty that as a result of work with internal and external experts and consultants in the late 1990s, multiple internal documents and articles, and the scientific literature as a whole, that Prolene mesh used in TVT Abbrevio not only could, but would shrink and contract, and that this shrinkage could lead to painful complications in women implanted with TVT Abbrevio, such as multiple erosions that can occur throughout one's lifetime, chronic and debilitating pelvic pain, recurrence, worsening incontinence, chronic dyspareunia, nerve injury, wound infection, rejection of the mesh, sexual dysfunction, urinary and defecatory dysfunction, vaginal scarring, wound healing problems, injury to ureters, pelvic abscess formation, risk of infection, and/or the need for additional surgeries, among others.

As a result, the polypropylene in Ethicon's TVT Abbrevio mesh (Prolene) is not suitable for its intended application as a permanent prosthetic implant for stress urinary incontinence in women, and Ethicon failed to warn physicians and patients of the possibility of shrinkage and contraction and the adverse outcomes that could occur as a result.

7. ETHICON HAD LIGHTER WEIGHT, LARGER PORE MESHES AVAILABLE

Ethicon did not change the Prolene mesh in its TVT Abbrevio device despite having better and safer options available for economic reasons. As early as May of 1997, Ethicon knew that the Prolene mesh was not ideal for use in vaginal tissues.⁹⁰ However, Ethicon

⁹⁰ ETH.MESH.12006257

believed that continued use of the Prolene mesh gave the company an economic and competitive advantage in marketing the product because they could continue to use the existing clinical data on the product to market the device, while if the mesh was changed, the existing clinical data would be obsolete.⁹¹ Dr. Brigitte Hellhammer testified that despite having incorporated the use of the lightweight, large pore Ultrapro mesh in vaginal tissues for the treatment of pelvic organ prolapse, the Ultrapro was never used by Ethicon in a device used for the treatment of stress urinary incontinence largely because the company wanted to continue to rely on the Ulmsten/Nilsson series of studies on 130 patients performed with the TVT device.⁹² Dr. Arnaud also confirmed that the company did not want to change anything with the mesh because of the exiting clinical data on the product.⁹³ It is my opinion to a reasonable degree of medical certainty that Ethicon was negligent in failing to correct the defects in the TVT Abbrevio mesh as the company had knowledge of the defects and failed to correct the defects with products and solutions that were already available to the company because it put its economic interests above the safety of patients.

B. THE TVT ABBREVO IFU LACKED ALL KNOWN RISKS AND WAS INACCURATE.

The purpose of the IFU is for a medical device manufacturer to provide physicians with the information necessary for them to make decisions regarding the used a medical device for a particular patient. In addition, the IFU should disclose adverse reactions and risks known to the medical device manufacturer to the physician so that the risks can be relayed to the patient and an informed decision regarding the use of the product can be reached. Throughout my education, training, surgical and clinical practice, I have reviewed

⁹¹ ETH.MESH.03911107

⁹² Hellhammer Dep. (9/11/13)

⁹³ Arnaud Dep. (7/19/13) 36:15-37:3

numerous IFUs for a variety of products, including mesh products in order to understand the proper way to use the device and to gain knowledge about the complications and adverse events associated with a device. I have extensive clinical experience with IFUs and instructing patients about the adverse events/risks contained in the IFU. Similar to Medical Directors, Dr. Martin Weisberg and Dr. David Robinson, I have gained expertise in IFUs through my extensive clinical experience reviewing IFUs, and consenting patients regarding IFUs, including Ethicon's own pelvic mesh products including the TVT line and Prolift.

Catherine Beath, Ethicon's former Vice President of Quality Assurance and Regulatory Affairs, testified that "physicians should be made aware of all the significant safety risks associated with the product in the IFU."⁹⁴ And, "a reasonably prudent medical device company would continually update the label consistent with developing data and information that becomes known to the company" when it is appropriate.⁹⁵ Similarly, former Medical Director Dr. David Robinson testified that the warnings and adverse event section of the IFU should include all significant risks and complications related to the procedure and the mesh.⁹⁶ According to Dr. Robinson, a device manufacturer must include this information because you want to make sure the doctors have all the information they need to adequately inform patients who are deciding to use the product.⁹⁷ According to Ethicon Medical Director Dr. Martin Weisberg, the goal of the IFU is to communicate the most important safety risks attributable to the TVT device and that an IFU should never exclude known hazards or complications.⁹⁸ Dr. Weisberg also believes that

⁹⁴ Beath Dep. (7/12/13) 592:7-11.

⁹⁵ Beath Dep. (7/11/13) 198: 8-13.

⁹⁶ Robinson Dep. (9/11/13) 238:12-25.

⁹⁷ Robinson Dep. (9/11/13) 239:1-11.

⁹⁸ Weisberg Dep. (8/9/13) 659:19-660:15.

an IFU should not knowingly underestimate the risks of using the product.⁹⁹ And, if an IFU excludes known complications or understates the risks, it “fails in one of its principal purposes.”¹⁰⁰

1. THE IFU DOES NOT INCLUDE ALL KNOWN RISKS.

As noted above, Ethicon did not include the proper information concerning the dissection in the original IFU. There were also numerous other potential risks that were not included in the IFU at launch. If you compare the adverse reactions/risks in the TVT Abbrevio IFUs to the adverse reactions/risks that were available and known to Ethicon at the time of the launch of TVT Abbrevio, it is clear that there are numerous adverse events absent from the IFU. For example in the TVT Abbrevio IFU at launch, the Adverse Reactions/Risks section read as follows:

ADVERSE REACTIONS

- Punctures or lacerations of vessels, nerves, bladder or bowel may occur during needle passage and may require surgical repair.
- Transitory local irritation at the wound site and a transitory foreign body response may occur. This response could result in extrusion, erosion, fistula formation and inflammation.
- As with all foreign bodies, PROLENE Mesh may potentiate an existing infection. The plastic sheath initially covering the PROLENE Mesh is designed to minimize the risk of contamination.
- Over correction, i.e., too much tension applied to the tape may cause temporary or permanent lower urinary tract obstruction.¹⁰¹

Despite only listing the above adverse reactions/risks, it is clear from the testimony of Senior Ethicon Employees in both the Medical Affairs and Regulatory Affairs that every adverse reaction/risk that Ethicon has scientific knowledge of today, it had scientific knowledge about at

⁹⁹ *Id.* at 960:13-16.

¹⁰⁰ *Id.* at 961:10-17

¹⁰¹ ETH.MESH.02340829.

the time the TVT was first sold in and certainly in 2004 when the first TVT Abbrevo was sold, marketed and launched. In 2015, Ethicon updated its IFUs in response to requests from Health Canada.¹⁰² The Adverse Reactions section now states as follows¹⁰³:

ADVERSE REACTIONS

- Punctures or lacerations of vessels, nerves, structures or organs, including the bladder, urethra or bowel, may occur and may require surgical repair.
- Transitory location irritation at the wound site may occur.
- As with any implant, a foreign body response may occur. This response could result in extrusion, erosion, exposure, fistula formation and/or inflammation.
- Mesh extrusion, exposure, or erosion into the vagina or other structures or organs.
- As with all surgical procedures, there is a risk of infection. As with all foreign bodies, PROLENE Mesh may potentially have an existing infection.
- Over-correction, i.e., too much tension applied to the mesh implant, may cause temporary or permanent lower urinary tract obstruction.
- Acute and/or chronic pain.
- Voiding dysfunction
- Pain with intercourse which in some patients may not resolve.
- Neuromuscular problems, including acute and/or chronic pain in the groin, thigh, leg, pelvic and /or abdominal area may occur
- Recurrence of incontinence
- Bleeding including hemorrhage, or hematoma
- One or more surgeries may be necessary to treat these adverse reactions.
- PROLENE Mesh is a permanent implant that integrates into the tissue. In cases in which the PROLENE Mesh needs to be removed in part or whole, significant dissection may be required.

OTHER ADVERSE REACTIONS

- Seroma
- Urge Incontinence
- Urinary frequency
- Urinary retention
- Adhesion formation
- Atypical vaginal discharge

¹⁰² Weisberg Dep. (11/12/2015) 23:21-24:7.

¹⁰³ HMESH_ETH_11049264 at 9271-72.

- Exposed mesh may cause or discomfort to the patient's partner during intercourse
- Death

Despite this update, Ethicon still chose to exclude from the list certain information of which it was aware at the launch of the product. This is most evidence in Medical Director Marty Weisberg's recent deposition regarding the 2015 updated IFU.¹⁰⁴ Medical Director, Piet Hinoul also testified that Ethicon understood the following adverse events occurred from the time the TVT was first sold, years before the first TVT Abbrevo was sold, yet none of these were in the TVT Abbrevo IFU at launch:

Erosions through vaginal epithelium
 Infection Pain
 Urinary Problems
 Erosions that could decrease patient's quality of life
 Dyspareunia
 Need for additional surgeries
 Need for the removal of device
 Urinary Tract Infections
 Dysuria
 DeNovo
 Urgency Mesh
 Exposure
 Fistula
 Formation
 Hematoma
 Abscess
 Formation
 Narrowing of vaginal wall
 Erosion which can occur any time in future
 Contracture of mesh causing pain
 Complications making it impossible to have sexual relations
 Worsening Incontinence

In addition, Ethicon failed to include significant risks in its IFU related to the Prolene polypropylene mesh, including association with tumor formations and that the mesh can

¹⁰⁴ Weisberg Dep. (11/13/15) 304-313.

degrade, shrink and contract. The IFU also fails to include risks associated with the Prolene mesh, including excessive rigidity, chronic foreign body reaction, fibrotic bridging, and infections/biofilms.

Dr. Weisberg also testified that Ethicon did not include: “permanent, lifelong, worsening and debilitating pain,” lifelong risk of surgical repairs for erosions, “severe or chronic inflammation,” fibrotic bridging, that the product can degrade, or cause severe erosion.¹⁰⁵ In addition, former Medical Director, Dr. David Robinson, testified that Ethicon never informed physicians that patients may require multiple surgeries to treat erosions, that erosions could be severe and untreatable, and that patients could endure lifelong severe pain or dyspareunia/painful sex. This is true despite, as discussed above, Ethicon had scientific knowledge of the risks at the time of launch.

2. THE IFU INACCURATELY PORTRAYED RISKS

In addition to excluding certain known risks, Ethicon significantly downplayed the risks that it actually listed in its IFU. This is especially true with respect to erosions. On the topic of erosions, in the Adverse Event/Risks section in the TVT Abbrevio IFU, in place from the time of launch until 2015, it states:

Transitory local irritation at the wound site and a transitory foreign body response may occur. This response could result in extrusion, erosion, fistula formation and inflammation.

In 2015, the new IFU was updated and this section was broken up into bullet points with little significant information added:

- Transitory local irritation at the wound site may occur.
- As with any implant, a foreign response may occur. This response could occur result in extrusion, erosion, exposure, fistula formation and/or inflammation.

¹⁰⁵ Weisberg Dep. (8/9/13) 968:12-972:21.

This language significantly downplays the permanent nature of erosions and suggests to physicians that erosions are a “transitory” or temporary problem. As shown in an email exchange between Ethicon’s Associate Medical Director of Worldwide Customer Quality Meng Chen, M.D., Ph.D and Bryan Lisa in the Regulatory Affairs Department, it was clear that the adverse events were not “transitory.” Chen wrote, “Pardon me again, from what I see each day, these patient experiences are not “transitory” at all.”¹⁰⁶

Ethicon also had scientific evidence that erosions could occur many years after implantation of the device. In Minutes from June 22, 2001 Scientific Advisory Committee on Pelvic Floor Repair, it was a “Consensus: Erosion is a risk. Erosion, possibly an infection response. Typically seen by 3 mos, usually by 6-12 mos. Can present late, 3 years. To vagina- not a good situation. To bladder, urethra or rectum-a very bad situation.”¹⁰⁷ “There have been reports of erosions into the urethra that are not picked up until months even years after the procedure.”¹⁰⁸ In October 2002, Medical Director Dr. Martin Weisberg was involved in email exchange with European Science Director Axel Arnaud about downplaying risks with respect to erosions. Specifically, Dr. Arnaud suggested to Dr. Weisberg that Ethicon needed “to be more elusive” when discussing potential complications like erosions.¹⁰⁹

According to Medical Director Dr. Martin Weisberg and former Medical Director Dr. David Robinson, Ethicon never disclosed or warned doctors or patients in IFUs or Patient

¹⁰⁶ ETH.MESH.04093125 (1/29/09 Email between Meng Chen and Bryan Lisa).

¹⁰⁷ ETH.MESH.02089392.

¹⁰⁸ ETH.MESH.04099233 (September 24, 2008 email from Melissa Day to Meng Chen and others).

¹⁰⁹ ETH.MESH.03910175-03910177.

Brochures that the use of TVT Abbrevio slings can cause lifelong risk of erosions.¹¹⁰ Despite the fact Ethicon had scientific feedback from one of its own doctors that experiences were not transitory and that she had concerns about the IFU and the transitory language, Ethicon never informed physicians or disclosed it in its IFU.

In summary, Ethicon did not fully inform physicians about numerous adverse reactions/risks associated with the TVT Abbrevio despite the fact that Ethicon had scientific knowledge of the risks from the time the product was first sold. As a result, physicians were unable to fully consent and inform patients of the risks associated with the TVT Abbrevio. In addition, some risks included by Ethicon in the IFU are mischaracterized to minimize the actual risk. To a reasonable degree of medical certainty, this prevented physicians and patients the ability to make an informed choice regarding the use of the TVT Abbrevio. To this day Ethicon continues to fail to warn physicians that the mesh used in Abbrevio is too stiff and rigid for vaginal tissue.

C. ETHICON WITHHELD MATERIAL FACTS ABOUT THE TVT ABBREVO'S UNDERLYING DATA.

Since the TVT was first launched, Ethicon has sent materials in various forms to physicians promoting long term follow up data on the original cohort of patients implanted with the TVT from 1995-1996.¹¹¹ Ethicon continued to cite to this data in all of its TVT materials. In addition, the materials tout low complication rates related to various adverse reactions, including erosions. These materials include press releases, marketing brochures and email blasts.

¹¹⁰ Weisberg dep. (8/9/13) 968:2-969:10; Robinson Dep. (9/11/13) 329:12-330:7.

¹¹¹ ETH.MESH.0015598, ETH.MESH.00658058, ETH.MESH.01186068, ETH.MESH.02236784, ETH.MESH.02237103, ETH.MESH.03459211, ETH.MESH.05183409, ETH.MESH.00339437; ETH.MESH.05794787.

The long term data primarily relied on by Ethicon throughout these materials relates to the Ulmsten/Nillson studies. These studies were originally started by Dr. Ulmsten, the inventor of the TVT, and continued by Dr. Nillson after Dr. Ulmsten's death. Prior to selling the TVT to Johnson & Johnson, Dr. Ulmsten owned a company called Medscand. As discussed more fully below, Johnson & Johnson hired Dr. Ulmsten and Medscand to conduct studies related to the TVT. To this day, Ethicon relies heavily on these studies and uses them in numerous promotional materials despite the fact that Ethicon never disclosed to physicians the potential conflict of interest and inherent bias that exists due to Dr. Ulmsten's relationship with Ethicon and Johnson & Johnson. In addition, Ethicon never disclosed to physicians that the device used in the original Medscand study was different than the TVT device. It is important to physicians using the TVT that the data in these types of promotional materials is accurate, unbiased and that physicians are informed about any potential conflicts of interest in the data contained within the materials. In other words, physicians rely on Ethicon to provide fair and balanced information and to ensure that physician have been given all the data and not just the positive press release data.

Despite using the Ulmsten data to promote the TVT, Ethicon never disclosed to physicians the bias and inherent conflict of interest related to the Ulmsten data. Specifically, in its promotional materials, Ethicon (Johnson and Johnson) never informed physicians about its relationship and contracts with Professor Ulmsten and his company Medscand. It is clear from the contracts that the publications and data from Dr. Ulmsten were contracted for hire by Johnson and Johnson International.¹¹²

The License and Supply Agreement between Johnson and Johnson International and

¹¹² ETH.MESH.08696085 at 085-6134.

Medscand (Ulmsten's Company) dated February 13, 1997, states in section 3.6 Milestone

Payments:

Johnson and Johnson International (JJI) shall pay shall pay to Medscand the following payments (b). A payment in the amount of \$400,000.00 due on February 28, 1997; provided, however, that in the event that Clinical Trials as specified in Exhibit C have not been completed by such date, then such amount shall not be due until the completion of the Clinical Trials.¹¹³

Under Exhibit F, Consulting Agreement with Professor Alf Ivar Ulmsten, section 4

Confidential Information Rights to Inventions and Copyrights (B) it states:

Any copyrightable work whether published or unpublished created by supplier Dr. Ulmsten directly as a result of or during the performance of services herein shall be considered a work made for hire, to the fullest extent permitted by law and all rights, titles and interest herein, including worldwide copyrights shall be the property of the company as the employer and party specially commissioned said work.¹¹⁴

Finally, in Exhibit C, Clinical Trials, it states:

The results of clinical trials will be considered acceptable if, first, they do not differ significantly from the results published in the original article published in the Int. Urogynecol J 1996-7:81-86 by U. Ulmsten, et.al., with regards to the following items: Safety 1.1, preoperative complications 1.2 , postoperative complications 1 year from operation 2. Efficacy. Second Long term results over 1 year from operation do not show a deterioration of rates significantly different from those of the standard suburethral slingplasties. It is assumed that from 12 – 60 months a gradual decrease in efficacy of 5% is normal. 3. No significant numbers of unexpected i.e. not addressed in the original article published in the Int. Urogynecol J 1996 81-86 by U.Ulmsten at et.al. procedure related i.e. not addressed in the review article published in the Int. Urogynecol J 19945: 228-239 by G. N. Ghomiem et.al. complications appear at any time in the postoperative course.¹¹⁵

In total, Dr. Ulmsten stood to gain millions of dollars for the 6 papers that he published on the TVT device. In addition, the results of those studies would be found acceptable for payment only if they did not differ from the parameters sent by Johnson &

¹¹³ ETH.MESH.08696091.

¹¹⁴ ETH.MESH.0869116.

¹¹⁵ ETH.MESH.08696132.

Johnson regarding complications and efficacy. The Ulmsten studies have an inherent conflict of interest and bias as they were “made for hire” and standards were set by Johnson & Johnson. As set forth above, if Dr. Ulmsten did not meet the standards set forth by Johnson & Johnson, he did not receive substantial payments for the “studies.” As a result of this relationship, there is a clear conflict of interest and potential for enormous bias issues.

The conflict of interest and bias created by the relationship between Ethicon and Dr. Ulmsten was acknowledged by Dr. Axel Arnaud, Ethicon’s European Medical Director, in a recent deposition. Specifically, Dr. Arnaud testified that such an agreement like the one discussed above between Dr. Ulmsten and Johnson & Johnson creates a potential conflict of interest.¹¹⁶ Dr. Arnaud also acknowledged that when Johnson & Johnson enters into this type of agreement with a physician or his company and the study is published, there “certainly” needs to be a disclosure of the relationship.¹¹⁷ Additionally, Former Ethicon Medical Director, Dr. David Robinson, testified that in his experience working in the industry for medical device manufacturers, it is best that potential biases be disclosed.¹¹⁸ He also testified that if publications from somebody like Ulmsten or Nilsson about safety and efficacy are being published, it is best if they disclose that they have a financial bias or conflict of interest.¹¹⁹ In fact, in an April 2009 email exchange with Medical Director Piet Hinoul about a physician who, like Ulmsten, is a consultant and inventor for competitor Boston Scientific, Dr. Robinson states that that situation presents “enormous bias issues.”¹²⁰ Despite two of its medical directors testifying that the relationship between Ulmsten and

¹¹⁶ Arnaud Dep. (7/20/13) 497:24-501:21, 509:8-17.

¹¹⁷ Arnaud Dep. (7/20/13) 514:17-515:1.

¹¹⁸ Robinson Dep. (9/11/13) 214:15-21.

¹¹⁹ Robinson Dep. (9/11/12) 215:8-13.

¹²⁰ ETH.MESH.03259439; Robinson Dep. (9/11/13) 219:6-220:10.

carried over to Nilsson presents a conflict of interest and bias, Ethicon has never disclosed this information in its promotional pieces. This is information physicians and patients have a right to know so that a proper informed decision regarding the value of the data in the studies and the use of the product can be made.

Aside from never disclosing to physicians the underlying conflict of interest and bias of the Ulmsten studies in its promotional pieces, Ethicon also never informed them about other problems with the data, including incomplete data on the original cohort, data incorrectly reported and erosion rates underreported. In the original 510k submission for TVT Classic, Ethicon used Medscand data from the Scandinavian Multicenter Study.¹²¹ The report shows that 12 month follow was obtained for 90 of the original 131 patients, without explanation of why there was a loss of 41 patients from the study. The study also describes a complication of wound infection: “while the vaginal infection required surgical intervention with resection of exposed mesh.” This represents a vaginal mesh erosion/extrusion/ exposure and needs to be reported as such. However, when the paper was published (Ulmsten, Int Urogynecol J 1998), the paper states that there was no defect healing and no tape rejections. It further misrepresents the outcome for this patient as “The patient with the wound infection had vaginal atrophy. After minimal vaginal wall resection and effective local estrogen treatment she healed without further intervention. There was no tape rejection.”

If Ulmsten had reported a mesh erosion/extrusion/exposure with mesh excision in his study, it would not have been acceptable under Exhibit C of his consulting contract for

¹²¹ ETH.MESH 00371587.

payment of the \$400,000.¹²² This demonstrates that the results of this paper were potentially biased by the payment Ulmsten would receive for favorable data and should discount the data. At the very least, Ethicon should have informed physicians about the relationship between Ethicon and the Ulmsten studies.

In one of the Nilsson studies, Dr. Nilsson describes four patients on “anticholinergics” (Int Urogynecol J 2008 Table 3). They conclude: “It is also encouraging to see that no late adverse effects of the polypropylene tape material was found and that erosion of the tape into adjacent tissue did not occur.” However, this statement cannot be made for 4 patients who are on pharmacotherapy without a cystoscopy, which was not performed in the 11 year follow-up study. Dr. Raz’s review of the literature found multiple cases of urethral erosions in a large series with TVT.¹²³ There have also been multiple case reports attesting to the fact that urethral erosion does occur specifically with Gynecare TVT products.¹²⁴ To imply that urethral erosion does not occur is not giving physicians fair and balanced information about the true incidence of urethral erosions with TVT products.

Later, Nilsson publishes the 5 year follow-up of this cohort.¹²⁵ He describes the cohort: “a prospective open multicenter trial was conducted in the Nordic countries at the beginning of 1995. The short-term results were published in 1998.” This implies that these are the same patients as published in 1998. It is interesting or an incredible coincidence that the exact number of patients receiving 12 months of follow-up in the Medscand publication

¹²² ETH.MESH 08696132.

¹²³ Karraam 2003, Hammad 2005.

¹²⁴ Sweat, S., et al, *Polypropylene Mesh Tape for Stress Urinary Incontinence: Complication of Urethral Erosion and Outlet Obstruction*, J Urology 2002, 168:144-146; Gerstenbluth, R.E., et al, *Simultaneous Urethral Erosion of Tension-Free Vaginal Tape and Woven Polyester Pubovaginal Sling*, J Urol. 2003, (2 Pt 1) 170:525-6; Vassallo, B.J., et al., *Management of iatrogenic Vaginal Constriction*, Am J Obstet Gynecol 2003, 102(3):512-20; Haferkamp, A., et al., *Urethral Erosion of Tension-Free Vaginal Tape*, J Urol 2002, 167(1): 250.

¹²⁵ Ulmsten data; Nilsson, Int Urogynecol J 2001.

(90) was the exact number being described in the 5 year study. There is again no mention of the outcome of the other 41 patients from the original cohort. Another interesting detail in the 5 year study is that the original number of centers used for the study (6) was now down to 3, again without explanation. The 5 year report does describe the original patient with the wound infection but again fails to mention she had mesh excised, “1 case (1.1%) of infection of operating site was observed.”

In 2006, Dr. Nilsson published a different study on long term outcome of patients with TVT.¹²⁶ He describes his new patient population: “A multi-center study comprising only carefully selected primary cases revealed a promising cure rate of 85% after 5 years (reference

his 5 year study) and 81% at 7 years.”¹²⁷ These two papers are the subject of many press releases and marketing brochures, but they never described that these were carefully selected patients. “To our knowledge, the long-term effect and effectiveness of the TVT procedure has not yet been studied in an unselected patient group. We earlier reported 16-month follow-up results of a general patient group referred to a tertiary medical unit and comprising primary, recurrent, mixed, and low pressure urethra cases. In the present study, we report the long-term results in the same above-mentioned group.” They describe a 3.1% mesh “visualized” rate, half of which needed surgical resection. These results, more representative of what one would see in a normal practice, is never mentioned in press releases or marketing documents.

Conversely, when Ethicon receives adverse information, it does not make it into the

¹²⁶ Kuuva, N., et al., *Long-term results of the tension-free vaginal tape operation in an unselected group of 129 stress incontinent women*, Acta Obstetrica Gynecologica Scandanavica 2006, 85:4 482-87.

¹²⁷ Nilsson, Obstet Gynecol 2004.

promotional pieces. Dr. AC Wang's abstract, "Tension-Free Vaginal Tape (TVT) for Urinary Stress Incontinence - A Preliminary Report" was used in the original 510k submission in October of 1997 as support for FDA clearance of the TVT.¹²⁸ However, when Dr. Wang reported that he had 25 cases of "failure of vaginal healing considered by him to be potential tape rejection...in each case the revision failed within 2 weeks, requiring further surgery to excise mesh and repair the vaginal wound," this important information never made it into the marketing materials or press releases.¹²⁹

The long-term follow-up data (Ulmsten/Nillson data) used by Ethicon to promote the lack of risk of TVT is spurious at best. We have incomplete data on the original cohort, data that is falsely reported, original sites that were excluded without explanation and a lead investigator who had a significant relationship and financial incentive to reach certain results with the data.

This is the same data which is now used repeatedly in promotional and marketing materials sent to physicians.

D. ETHICON'S PATIENT BROCHURES MISSTATE OR OMIT INFORMATION REGARDING COMPLICATIONS AND SUCCESS RATES AND OVERSTATE THE BENEFIT OF THE TVT ABBREVO WHILE UNDERSTATING THE RISKS.

In its TVT Abbrevio brochure, Ethicon represents to patients and physicians that the success rate of the TVT Abbrevio device is around 98%.¹³⁰ This claim is based on a 12-month, single center randomized, single-blinded prospective trial. However, the device in the trial was not the as-marketed TVT Abbrevio. The brochure also claims there is significantly less post-operative pain and other such benefits which further mislead customers into

¹²⁸ ETH.MESH.00371551.

¹²⁹ ETH.MESH.00409675.

¹³⁰ ETH.MESH.11434264.

thinking the TVT Abbrevio is a safer product than the TVT Obturator.

In a similar marketing aid, Ethicon states that the TVT Abbrevio gives women “a proven approach to treating stress urinary incontinence.”¹³¹ However, this marketing document provides no support for such statements. On the next page, entitled “Essential Product Information” Ethicon lists indications, contraindications, warnings and precautions, and adverse reactions. Importantly, these sections do not mirror the language in the IFU and the information regarding “transient” or “transitory” irritation or pain is misleading as the post-operative complications can be life-long and debilitating. The minimization of the risks is an unfair balance of the TVT Abbrevio’s risks and benefits and misleads patients and physicians into thinking that the product is safe and effective.

E. POST-MARKETING ADVERSE EVENTS

Ethicon did not actively try to determine how many patients were hurt by its devices, including the TVT Abbrevio, or how severely they were hurt. Instead, Ethicon had a “passive” system of measuring how many and what type of adverse events the TVT Abbrevio was causing. Ethicon’s Director of Post-Marketing Surveillance testified that this type of passive collecting of reports understates how many people are actually being hurt by its devices:

THE WITNESS: So we -- from a reactive perspective for complaints, we can only process the complaints that are reported to us, so -- and as we discussed earlier, they come from many different avenues; but again, they're reactive in nature, which means we are processing what is given to us or reported to us.

...

Q. You understand that spontaneous adverse event reporting, such as your department collects and analyzes, has been demonstrated to substantially under quantify the real complications in the world?

A. So the adverse events that are reported to us, complications, complaints that are reported to us, are a subset of the events,

¹³¹ ETH.MESH.09744866.

complaints, complications that occur in the field.¹³²

In fact, Ethicon employees ensured that they would not “actively” collect any complaints. When discussing how to perform a marketing survey with a number of physicians, Dan Smith wanted to ensure Ethicon people did not ask physicians questions that might “collect” a complaint:

Just a thought with regard to us collecting information. Paul, what was the ruling from our compliance group regarding us asking questions/collecting data, did we have to log issues as complaints???? et cetera. If so, we should do this in a manner that avoids this issue.¹³³

Dr. David Robinson, Ethicon’s Medical Director, noted a reason that Ethicon might not want to actively collect adverse events about its products: “[I]f this starts getting reported, it is going to scare the daylights out of docs.”¹³⁴

Even though Ethicon limited its “surveillance” to passively collecting complaints, it did not do this well. For example, Mark Yale, the head of Ethicon’s Worldwide Customer Quality team testified that all Ethicon employees had a legal duty to report any and all complaints to the Company about which they became aware.¹³⁵ When shown documentation, Yale admitted that this collection system was flawed. For example, employees in a US call center failed to report complaints,¹³⁶ employees in Eastern Europe did not know they were

¹³² Lamont Dep. (4/4/13) 389:25-390:23; Yale Dep. (8/7/13) 126:20-127:7 (“So you would agree that generally in a passive complaint collection, which is what Ethicon had prior to this discussion about the registry, for example, in a passive collection, that it is well known and well recognized that adverse events are underreported. Correct? THE WITNESS: In general, the basic understanding in the world of complaints and adverse events is that you do not get 100 percent reporting, that, you know, it is not the perfect collection model to gather. So, yes, they are, in some manner, underreported.”).

¹³³ ETH.MESH.01811770.

¹³⁴ ETH.MESH.00756984 (Email from David Robinson, M.D. to Giselle Bonet and Marty Weisberg).

¹³⁵ Yale Dep. (8-7-2013) 140:12 to 140:16.

¹³⁶ Yale Dep. (8-7-2013) 145:12 to 145:15.

required to inform the Company of complaints and adverse events,¹³⁷ one Portuguese employee testified that he would not have reported the complaint, but someone had already informed the regulatory authorities:

Q. So Francisco in Portugal working for Johnson & Johnson Medical says he wouldn't have reported this to you, this complication, except for the fact that somebody reported it to their regulatory authorities. Right?

A. That's what he wrote. Correct.¹³⁸

This line of questioning led to a consistent theme about adverse events and complications tracking at Ethicon – you don't know what you don't know. Yale testified:

Q. So as you sit here today, you have no idea how many other complaints didn't make it here from Portugal, because Francisco Noronha from Johnson & Johnson decided that if it wasn't reported to his regulatory agency, he's not going to tell you about it. Right?

THE WITNESS: I don't know what I don't know.¹³⁹

When David Menneret, an employee of the mesh manufacturer at Ethicon SARL received a complaint about mesh being frayed (a significant issue as discussed above) he was unsure whether to report it as a “complaint” into the Ethicon complaint tracking system. He wrote:

Please see attached below a letter...regarding Mesh fraying. I don't know exactly who should be informed of this kind of customer feeling so feel free to forward to anyone concerned. Do you think this should be entered as a complaint in the system?¹⁴⁰

Again, Yale testified that he could not know how many complaints went to the manufacturer

about the fraying from the manufacturing process that ultimately were not reported to

¹³⁷ Yale Dep. (8-7-2013) 155:21 to 155:25.

¹³⁸ Yale Dep. (8-7-2013) 159:5 to 159:10.

¹³⁹ Yale Dep. (8-7-2013) 160:16 to 160:24.

¹⁴⁰ ETH.MESH.01814252.

Ethicon's complaint tracking system. He testified as follows:

Q. You don't know how many times Menneret didn't report a complaint either. Right? You don't know what you don't know. Right?

THE WITNESS: As I said before, I do not know what I do not know....Yale Dep. (8-7-2013) 168:24 to 169:12. ¹⁴¹

Prior to March of 2006, Ethicon did not even have a formal procedure in place to capture adverse events from its own clinical trials. Therefore, it had no idea how many adverse events occurred but were not reported from those trials.¹⁴² Most importantly, Ethicon does not track the complaints for any trends in adverse events between laser cut mesh and mechanical cut mesh.¹⁴³ Katrin Elbert testified that "it would be very difficult to do, given the way complaint data comes in."¹⁴⁴

In addition to the marketing materials, Ethicon also provided physicians with "Complications Statements" during training or upon request. These "Complication Statements" relied upon the information captured in Ethicon's complaint system – the same system described above. Accordingly, the capture of information for these statements was already severely compromised. However, even for those events Ethicon did capture, the reporting of these events in the Complications Statements was completely misleading.

Joseph Scavona, a complaint analyst, was responsible for creating one of these Complications Statements that was provided to physicians. He described how he created the statement and how, if a woman had multiple injuries, he only listed one injury on the chart. He wrote:

[S]ome complaints could be described with multiple main & sub categories,

¹⁴¹ Yale Dep. (8-7-2013) 168:24 to 169:12.

¹⁴² Yale Dep. (8-7-2013) 194:22 to 195:7.

¹⁴³ Trial Transcript of Katrin Elbert, *Perry v. Luu, et al.*, (2/11/15) 3438:3-3439:2; Trial Transcript of Piet Hinoul, *Batiste v. Ethicon and Johnson & Johnson, Inc.*, (3/27/2014) 40-45.

¹⁴⁴ Trial Transcript of Katrin Elbert, *Perry v. Luu, et al.* (2/11/15); 3438:14-19.

but each complaint was only labeled with one of these categories (e.g. patient had pain, bleeding, hematoma, exposure, and dyspareunia thus complaint was coded only “mesh exposure”).¹⁴⁵

This completely misrepresented the actual harms data. Moreover, the person making these decision, Scavona, was not a medical doctor. He recognized these limitations and requested that medical review the complications data, but it did not occur.¹⁴⁶ Instead, physicians were provided with misleading, inaccurate and incomplete information in the Complications Statements.¹⁴⁷

In my opinion Ethicon’s collection and reporting of adverse events and complications to physicians and patients was incomplete, inaccurate and misleading. As manufacturers are the only entities with access to complaint information, physicians and patients must rely upon them to provide timely, accurate and complete information. Ethicon failed to do so. Without accurate information, physicians could not and cannot obtain informed consent from their patients, nor can patients give informed consent. Ethicon’s complaint collecting and reporting system made this impossible.

F. ETHICON’S FAILURE TO DISCLOSE THE CONTENTS OF THE MSDS

According to Ethicon Medical Director, Dr. Martin Weisberg, a Material Safety Data Sheet (MSDS) is “a document that discusses the product, the composition, any potential hazards from it . . . Generally, the safety particular of products.”¹⁴⁸ As it relates to polypropylene, I have reviewed several MSDSs for polypropylene resin used to manufacturer meshes used in various pelvic floor meshes. All of the MSDSs discussed

¹⁴⁵ ETH.MESH.02122904 (Ex. 970) (Email from Joseph Scavona to others re “TVT Complications Statement 2008”). Complications Statement attached at ETH.MESH.00007091 at 2 (Ex. T-970).

¹⁴⁶ *Id.*

¹⁴⁷ Yale Dep. (8-8-2013) 294 to 300.

¹⁴⁸ Weisberg Dep. (8/9/13) 909:2-9.

below are available to the public.

Sunoco, the manufacturer for the polypropylene resin used to manufacture Ethicon's pelvic floor products lists the possibility that polypropylene mesh can cause tumors or cancer. This is documented by the Sunoco MSDS¹⁴⁹ from April 13, 2005 which states in relevant part:

OTHER INFORMATION

Follow all MSDS/label precautions even after container is emptied because it may retain product residue.

COMPONENT TOXICITY: Polypropylene has been tested in laboratory rats by subcutaneous implantation of discs or powder. Local sarcomas were induced at the implantation site. No epidemiological studies or case report suggest any chronic health hazard from long term exposure of polypropylene decomposition products below the irritation level. (OARC, 19, 128).¹⁵⁰

Dr. Martin Weisberg, Ethicon Medical Director, is not only familiar with this MSDS, he also has personal experience with it. Dr. Weisberg agrees that the manufacturer of Ethicon's mesh did a study by implanting it under the skin of rats and it did in fact induce sarcomas.¹⁵¹

Dr. Weisberg also agrees "if there was evidence of cancer-causing abilities of polypropylene . . . a reasonable doctor would want to know."¹⁵² And, despite evidence to the contrary in the above MSDS for the resin used to make the polypropylene mesh for TVT, he is not aware of any instance when Ethicon "disclosed to any doctor that there's any evidence that the use of polypropylene mesh might induce sarcomas in its patients."¹⁵³

Dr. David Robinson, a former Ethicon Medical Director, testified he was unaware of Ethicon ever performing any studies or research to determine whether polypropylene could

¹⁴⁹ ETH.MESH.02026591 at 6591-6595.

¹⁵⁰ *Id.* at 02026595.

¹⁵¹ Weisberg Dep. (8/9/13) 951:6-10.

¹⁵² *Id.*

¹⁵³ *Id.* at 951:11-16.

cause cancer in the long term.¹⁵⁴ In addition, he testified that Ethicon never disclosed “the potential that polypropylene in the product could be cancer causing.”¹⁵⁵ Dr. Robinson also testified that it would be reasonable for physicians to want to know about polypropylene possibly causing cancer.¹⁵⁶

Another MSDS from Chevron Phillips¹⁵⁷, a manufacturer of polypropylene resin states:

MEDICAL APPLICATION CAUTION: Do not use this Chevron Phillips Chemical Company LP material in medical applications involving permanent implantation in the human body or permanent contact with internal body fluids or tissues.

Do not use this Chevron Phillips Chemical Company LP material in medical applications involving brief or temporary implantation in the human body or contact with internal body fluids or tissues unless the material has been provided directly from Chevron Phillips Chemical Company LP under an agreement which expressly acknowledges the contemplated use.

Chevron Phillips Chemical Company LP makes no representation, promise, express warranty or implied warranty concerning the suitability of this material for use in implantation in the human body or in contact with the internal body fluids or tissues.

With respect to the Chevron Phillips MSDS, Ethicon Medical Director, Dr. Martin Weisberg, testified that he did not have the Chevron Phillips MSDS in 2001 when he reviewed the Sunoco MSDS and no one at Ethicon alerted him to it.¹⁵⁸ If he had been alerted to the Chevron Phillips MSDS, it may have “triggered” an investigation on his part.¹⁵⁹ He also believes that if Ethicon knew about this MSDS, Ethicon should have studied the issue

¹⁵⁴ Robinson Dep. (9/11/13) 1105:17-110:14.

¹⁵⁵ Robinson Dep. (9/11/13) 1114:15-18.

¹⁵⁶ Robinson Dep. (9/11/13), 1115:5-19.

¹⁵⁷ Chevron Materials Safety Data Sheet Marlex Polypropylenes (All Grades) Revision Number: 3 (Ex. T-3137)

¹⁵⁸ Weisberg Dep. (8/9/13) 944:16-945:5.

¹⁵⁹ *Id.*

and, if they did not do so, it would have been a violation of the company Credo.¹⁶⁰

Total Petrochemicals, the polypropylene resin manufacturer for the polypropylene used in AMS' pelvic floor products, Technical Data Sheet for Polypropylene PPR 7220, states in bold red lettering "Under no circumstances are any products sold by Total Petrochemicals suitable for human or animal implants." It is further documented that, "The above-mentioned product is NOT in compliance with the US pharmacopoeia because we DID NOT perform required tests." (emphasis from the original document).¹⁶¹

The manufacturer of the polypropylene resin for the polypropylene used in competitor pelvic floor products, Phillips Sumika Polypropylene Company, included a similar warning in its MSDS.¹⁶² Specifically, it states:

Do not use this Phillips Sumika Polypropylene Company material in medical applications involving permanent implantation in the human body or permanent contact with internal body fluids or tissues. Do not use Phillips Sumika Polypropylene Company material in medical applications involving brief or temporary implantation in the human body or contact with internal body fluids or tissues unless the material has been provided directly from Phillips Sumika Polypropylene Company under an agreement which expressly acknowledges the contemplated use. Phillips Sumika Polypropylene Company makes no representation, promise, express warranty or implied warranty concerning the suitability of this material for the use in implantation in the human body or contact with internal body fluids or tissues.

As discussed above, the possibility that polypropylene mesh can cause tumors or cancer is documented in the Sunoco MSDS, the manufacturer of the polypropylene resin used in the TVT Prolene mesh.¹⁶³ Specifically, the Sunoco MSDS from April 13, 2005 states: COMPONENT TOXICITY: Polypropylene has been tested in laboratory rats by

¹⁶⁰ *Id.* at 947:4-19.

¹⁶¹ ETH.MESH.02026591.

¹⁶² Phillips Sumika Polypropylene Company Material Safety Data Sheet Marlex Polypropylene (All Grades) Revision Number: 5.03 Revision Date: 12/4/2008.

¹⁶³ ETH.MESH.02026591-6595.

subcutaneous implantation of discs or powder. Local sarcomas were induced at the implantation site. No epidemiological studies or case report suggest any chronic health hazard from long term exposure of polypropylene decomposition products below the irritation level.”¹⁶⁴

Despite this warning in the MSDS for the polypropylene resin used to manufacture the TVT mesh, there is no evidence that Ethicon informed surgeon about this important information contained in various Manufacturer Safety Data Sheets (MSDS) regarding the use of polypropylene. This information includes the dangers of using polypropylene in a permanent implanted medical device set forth in MSDS that were in the public domain and available to Ethicon if they chose to look. Ethicon also failed to inform physicians that laboratory studies on rats showed that polypropylene caused sarcomas.

The fact that this information has not been disclosed to physicians in any manner (IFUs, direct letters or promotional materials) is especially concerning in light of literature showing reports of cancer associated with polypropylene. Specifically, there have been cases of pseudotumor reported in polypropylene for hernia mesh¹⁶⁵ and inflammatory myofibroplastic tumor of low malignant potential with a TVT device.¹⁶⁶ In addition, there have been 2 cases of bowel cancer associated with mesh used for abdominal sacrocolpopexy, one associated with mersilene and one with polypropylene and TVT placement.¹⁶⁷ A case of primary vaginal leiomyosarcoma associated with TVT and anterior repair with Bard Duraderm has also been reported.¹⁶⁸

¹⁶⁴ ETH.MESH.02026595.

¹⁶⁵ Karrem,M., Community Oncology, Volume 7/Number 4/April 2010.

¹⁶⁶ Kwon S., et al, Female Pelvic Med Reconstruct Surg, Volume 18, Number 4, July/August 2012.

¹⁶⁷ Ahuja, S., et al, Gynecol Surg 2011, 8:217-221.

¹⁶⁸ Moller, K., et al, Gynecologic Oncology 94 (2004) 840-842.

Finally, a report of angiosarcoma associated with Darcon vascular grafts was reported in 1999.¹⁶⁹ The authors of this article noted at least 8 other sarcomas developing at the site of vascular prosthesis, and that the rate of these sarcoma, associated with foreign bodies, was much higher than the rate of sarcomas in general. All sarcomas associated with Darcon grafts were high grade histology and disseminated at the time of presentation. The authors also describe sarcoma reported at the site of other foreign bodies, such as shrapnel, bullets, steel plates and retained surgical sponges. They also note that the latency period from the acquisition of the foreign body and the development of sarcoma had a mean of 33 years. They document that a chronic foreign body reaction, the same "microscopic foreign body reaction" described by Dr. David Robinson in his Sept 2013 deposition as being clinically insignificant, was the etiology of this carcinogenesis. The authors also describe sarcomas developing in rodents after inert plastic polymers were placed in their soft tissue: "The sarcomas developed in rodents in which thick fibrous capsules developed around the implanted material." The authors conclude: "For unknown reasons, the cells in this inflammatory and repair process may undergo a malignant transformation, probably associated with oncogene activation and tumor suppressor gene inactivation. Further studies are warranted to search for the mechanisms involved in foreign body tumorigenesis." To date no manufacturer of mesh products has investigated this oncogenic potential as the authors recommended. In a report from the International Agency for Research on Cancer: Surgical Implants and Other Foreign Bodies, "When several polymers were tested in rats according to the same experimental protocol, sarcoma incidences ranged from 70%

¹⁶⁹ Ben-Izhak, O., et al, Am J Surg Pathology, Issue: Volume 23 (11), 1999, p. 1418.

(polypropylene) to 7% (silicone).”¹⁷⁰ “Polymeric implants prepared as thin smooth films (with the exception of poly(glycolic acid)) are POSSIBLY CARCINOGENIC TO HUMANS.”¹⁷¹

Given the fact that hernia mesh placement increased in the 1990's with the advent of laparoscopic placement, and that vaginal mesh placed for SUI and POP accelerated in the 2000's, we may be on the cusp of an ever increasing number of foreign body tumors associated with vaginal mesh. Ethicon did not undertake any long term testing to determine whether or not these warnings on the polypropylene resin manufacturers MSDS were associated with long term consequences for permanent human use. This is true despite the fact that Ethicon has knowledge of three of these cancer reports (Kwon, Moller and Ahuja) as they are referenced in Ethicon's 2013 Clinical Evaluation Report regarding TVT.¹⁷²

Additionally, there is no evidence that Ethicon made any effort to inform surgeons of important information contained in various Manufacturer Safety Data Sheets (MSDS) regarding the use of polypropylene. This information includes the dangers of using polypropylene in a permanent implanted medical device. And, that laboratory studies on rats showed that polypropylene caused sarcomas in laboratory rats. Clearly, these facts are critical information relevant to both the surgeon evaluating his or her treatment options and to the patient's informed consent decisions. As a result, Ethicon failed to act like a reasonable and prudent medical device manufacturer.

G. POLYPROPYLENE MESH IS CYTOTOXIC.

¹⁷⁰ International Agency for Research on Cancer, Summaries and Evaluations, Vol.:74 (1999).

¹⁷¹ McGregor, D.B., et al, European Journal of Cancer 36 (2000) 307-313 (emphasis added).

¹⁷² ETH.MESH.10150515.

Cytotoxicity means toxicity to the cells causing cell injury or death.¹⁷³ In a May 26, 2000, Ethicon Memo titled “Review of biocompatibility on the tension-free vaginal tape (TVT) system for compliance to FDA,”¹⁷⁴ the review contains a “Cytotoxicity Risk Assessment for the TVT (Ulmsten) Device” from August 8, 1997.¹⁷⁵ The Cytotoxicity Assessment states “there is some evidence to suggest that the PP [polypropylene] mesh from the sterile Ulmsten device maybe have cytotoxic potential.”¹⁷⁶ In addition, ISO Elution testing, resulted in marked cytotoxicity in tests conducted at Ethicon (Scotland).¹⁷⁷

According to former Ethicon Medical Director, Dr. David Robinson, Ethicon never performed “a single long-term study. . . to determine whether or not the Ethicon mesh clinically cytotoxic in women.”¹⁷⁷ In addition, in its IFU and Patient Brochures, Ethicon never informed physicians or their patients about the possibility of cytotoxicity.¹⁷⁸ Dr. Robinson testified that if there is a clinical related outcome related to cytotoxicity, it is reasonable for physicians to want to know that the mesh in the TVT product had been tested multiple times to be severely or marked cytotoxic.¹⁷⁹

Cytotoxcity can cause death to cells that can lead to an inflammatory response leading to a multitude of injuries, including serious adverse complications such as erosions, chronic pelvic pain, recurrence, worsening incontinence, dyspareunia, wound infection, rejection of the mesh, sexual dysfunction, urinary and defecatory dysfunction or the need for additional surgeries. Ethicon did not undertake any long term testing to determine whether

¹⁷³ McGregor, D.B., et al, European Journal of Cancer 36 (2000) 307-313 (emphasis added).

¹⁷⁴ ETH.MESH.06852118 at 2118-2119 (5/26/2000 Biocompatibility Review).

¹⁷⁵ ETH.MESH.06852120 (8/8/1997 Cytotoxicity Risk Assessment).

¹⁷⁶ *Id.* and Robinson Dep. (9/11/13) 1098:23-1099:9.

¹⁷⁷ Robinson Dep. (9/11/13) 1101:24-1102:5.

¹⁷⁸ Robinson Dep. (9/11/13) 1114:15-18.

¹⁷⁹ Robinson Dep. (9/11/13) 1115:5-19.

the marked cytotoxicity found in the TVT mesh had long term consequences for permanent human use. This is true despite the fact that its own test results showed the mesh to be cytotoxic.

The potential for cytotoxicity or cell death is important information the physicians need to know in order to pass the information on to their patients so that an informed decision can be made about whether to have a permanent medical device implanted in their body. It is clear from Ethicon's Medical Director, Dr. David Robinson, that this information was never passed on to physicians despite the fact that it would have been reasonable for physicians to have this information. As a result, Ethicon did not act as a reasonably prudent medical device manufacturer in that it failed to inform physicians and their patients about the risk of its mesh being cytotoxic.

F. THE BENEFITS OF TVT ABBREVO ARE OUTWEIGHED BY TS COMPLICATIONS.

It is my opinion, based on my training, experience and extensive review of the literature and Ethicon's internal documents that the benefits of the TVT Abbrevio are outweighed by the severe, debilitating and life changing complications associated with the medical device. It is clear that a substantial number of women who are implanted with the TVT Abbrevio have already and will continue to suffer chronic, debilitating erosions or pain, among other complications, and these life changing complications outweigh the benefits of the TVT Abbrevio, a device used to treat a quality of life issue.

This is especially true given that traditional surgeries like the Burch and pubovaginal slings are not associated with the frequency or extent of these life changing complications. The efficacy of the TVT Abbrevio is equivalent to the traditional surgeries like the Burch. Traditional surgeries are not associated with TVT Abbrevio mesh based complications like

contraction and erosion, however, with clinically significant erosion. And, further, although traditional surgeries can cause symptoms such as pain following surgery, including dyspareunia, the risk, duration, extent and severity of chronic pain including dyspareunia following the TVT Abbrevio is much greater than with traditional surgeries, and of course those surgeries do not result in the often untreatable complications and symptoms that result from the TVT Abbrevio mesh.

There were reasonably feasible alternatives available to Ethicon for the treatment of patients in this case. For example, the Burch procedure would have been an appropriate treatment for SUI. The Burch procedure eliminates the risks specifically associated with the old construction heavyweight mesh used in the TVT Abbrevio because the Burch procedure does not require the use of mesh. Another feasible alternative to the TVT Abbrevio would have included autologous fascia slings that also do not require the use of mesh. Sutures used in an alternative design to the TVT Abbrevio (i.e., Burch); an autologous fascial sling; or, an allograft sling (i.e., Repliform) would have been a safer alternative design to the TVT Abbrevio. Additionally, based on Ethicon's internal documents, deposition testimony, and medical literature, feasible alternatives would have included individually or collectively lighter weight, larger pore mesh material. Ethicon had lighter weight, larger pore meshes that were less stiff and rigid, and more compliant with patients' tissues that it marketed for use in the pelvis.

Unfortunately, although there have been a large number of studies and publications involving the TVT-O over the years, the quality of most of the studies is not good, and the amount of bias included in the studies and publications adds to the limited value that the studies offer about long term, severe and debilitating complications like chronic pain and

erosions associated with the TVT Abbrevio. The most recent Cochrane review of mid-urethral slings, Ogah (2011), concluded that most trials involving mid-urethral slings had short follow-up and the quality of evidence was variable such that the quality of evidence for the majority of trials was moderate with a minority having low-to-moderate evidence.¹⁸⁰ Few trials reported outcomes after 1 year and long term adverse effects had yet to be determined. There are only a handful of RCTs involving the TVT that are long term, and major and long term complications would unlikely be picked up in these RCTs in part because they are designed with a primary endpoint of efficacy, not safety. The true incidence are more likely to be determined by registries or databases, but published registries do not track certain complications such as pain or dyspareunia, and have not been designed to monitor long term problems (Tamussino, 2001 and 2007; Kuuva 2002, Collinet, 2008, Dykorn 2010). This void in studying and presenting the true incidence and nature of long term and life altering complications, along with the biases inherent in many of the studies, and other factors, negates the value of the large majority of the studies, and as a result, other sources of data such as published case series are relevant and important to truly understand the nature of these complications. Ethicon's internal documents and data, which are not publically available, present a very different picture of the TVT Abbrevio than the information that has been shared with patients and physicians.

V. CONCLUSION

Ethicon has marketed and sold the TVT Abbrevio despite the fact that it contains numerous characteristics that make it unsuitable for implantation in a woman's vagina. These characteristics include the following: (1) excessive rigidity; (2) degradation of

¹⁸⁰ Ogah, et. al., Minimally Invasive Synthetic Suburethral Sling Operations for Stress Urinary Incontinence in Women: A Short Version Cochrane Review. *Neurology and Urodynamics* 30:284-291 (2011).

the mesh; (3) chronic foreign body reaction; (4) infections and bio-films; (5) fibrotic bridging leading to scar plate formation and mesh encapsulation; and (6) shrinkage/contraction of the encapsulated mesh.

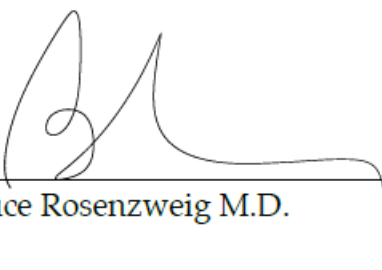
Not only does Ethicon sell a product which should never be put in the vagina, it failed to inform physicians and their patients about numerous risks associated with the product despite the fact that these risks were known before the product was launched. Ethicon has removed the ability of physicians to appropriately inform their patients of the risks and benefits of the TVT Abbrevio and made it impossible for women to consent to the procedure. In addition, despite having knowledge to the contrary, Ethicon never informed physicians and their patients that the TVT Abbrevio was associated with cancer and could be toxic to their bodies. Finally, while keeping this information from women, Ethicon marketed its product with promotional pieces that did not disclose key conflict of interest information or the true complication rates of its products.

As a result of these failures, the TVT Abbrevio has caused and will continue to cause a multitude of injuries in women, including the possibility of multiple erosions that can occur throughout one's lifetime, chronic and debilitating pelvic pain, nerve injury, recurrence, worsening incontinence, chronic dyspareunia, wound infection, rejection of the mesh, sexual dysfunction, urinary and defecatory dysfunction, vaginal scarring, wound healing problems, injury to ureters, pelvic abscess formation, risk of infection, and/or the need for additional surgeries, among others.

All opinions I have are to a reasonable degree of medical certainty. I understand discovery is still ongoing in this case and I reserve my right to amend my opinions if further information is provided in any form including, but not limited to, corporate documents,

depositions and expert reports of both Plaintiff and Defense experts. I incorporate my past reports and testimony on Abbrevio and the laser cut mesh used herein.

Signed this 22nd day of May 2017

X 
Bruce Rosenzweig M.D.